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THE AGRICULTURAL GAZETTE OF CANADA

Vol. VIII November-December, 1921 No. 6

LEADING TOPICS

Admission of Canadian Cattle into the United Kingdom—Report of Royal Commission.

Live Stock Improvement Measures.

Cow-Testing, 1920.

Gopher Control, A New Method.

Investigational Work—Ontario Agricultural College.

Order of Agricultural Merit—Quebec.

Agricultural Education in Canada—Concluded.

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STORAGE

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

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The AGRICULTURAL GAZETTE
OF CANADA

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MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

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J. B. SPENCER, B.S.A., Director of Publicity.

REPORT OF THE
ROYAL COMMISSION ON THE IMPORTATION OF STORE CATTLE
INTO THE UNITED KINGDOM

ON May 11, 1921, His Majesty, King George V, appointed a Commission to inquire into the admission into the United Kingdom of live stock for purposes other than immediate slaughter at the ports. The Commissioners were Robert Bannatyne, Viscount Finlay (chairman); George Ranken, Baron Askwith, Sir Algernon Freeman Firth, Sir Arthur Everett Shipley, and Sir William Henry Peat.

The terms of reference were as follows:—

> "To inquire into the admission into the United Kingdom of live stock for purposes other than immediate slaughter at the ports; whether such admission would increase and cheapen the meat supply of the country, and, if so, to what extent; and whether such admission is advisable, having regard to the necessity of protecting live stock bred in the country from the introduction of disease and of restoring their numbers after the losses to which they have been subjected during or since the war."

The Inquiry

The sittings, 25 in number, began on May 30, 1921, and continued until July 6. Altogether 92 witnesses were examined. These included two ex-Ministers of Agriculture for the United Kingdom, Lord Chaplin and Lord Ernle. The Hon. S. F. Tolmie, Minister of Agriculture for the Dominion of Canada, and the Hon. Duncan Marshall, who was then Minister of Agriculture for the Province of Alberta, also gave evidence. The other witnesses consisted of Officials, English Farmers, Scottish Farmers, Irish Farmers, Representatives of the Irish Cattle Trade, the Meat Trade, Local Authorities, Free Importation of Canadian Cattle Association of Great Britain, and others.

Omitting the Historical Review and certain other preliminary material, the Report is published in its entirety, as follows:—

Scope of Reference

The inquiry which we are directed to make is as to the admission into the United Kingdom of live stock for purposes other than immediate slaughter at the ports. In terms this might include an inquiry as to the admission of live stock of any description, including cattle, sheep and pigs coming from any part of the world. We propose to confine our Report to the subject of the admission of cattle coming from Canada. The prohibition, the history of which we have given in brief outline, has been the subject of controversy almost exclusively with reference to cattle. Sheep and pigs have hardly entered into the discussion, and we have no evidence before us which would justify any finding with regard to either of them. The Secretary to the Commission received, it is true, but after the close of the evidence and addresses of Counsel, a letter dated the 7th July of this year from H.E. the Danish Minister, enclosing for our consideration a memorandum on behalf of the Icelandic Government on the question of the admission into the United Kingdom of Icelandic sheep as stores. The memorandum stated that there had been no foot and mouth disease in Iceland for 40 years, and that for the purpose of protecting the live stock of Iceland, all importation of live sheep and other domestic animals into Iceland is prohibited. According to the memorandum it was estimated that if admission should be conceded, at least 50,000 store sheep would, in a few years, be available annually for British markets. In view, however, of the paucity of evidence on the subject of Icelandic sheep we think that it would not be right, on the present occasion, to include them in this inquiry.

It is clear that the cattle referred to in the terms of reference must be cattle suitable for food as commonly used in this country, and that horses do not fall within its terms.

Further, the inquiry for all practical purposes must relate to cattle coming from Canada. It is with regard to Canadian cattle that the question has arisen, and it is to Canadian cattle that the evidence has been directed. The prohibition against importation, except for immediate slaughter, applies to cattle coming to the United Kingdom from any part of the world, and no case for exemption from it has been put forward except on behalf of Canada. It was urged by way of objection to the Canadian application that it would be impossible, in practice, to discriminate and that diplomatic difficulties might arise with foreign countries if Canadian stores alone were admitted. We do not think that this objection is of weight. Canada is an integral part of the British Empire, and if Canada makes out a case for admission, no complaint could be made by a foreign country that it would be unfair to admit the cattle of Canada alone. Considerations of a similar kind would apply as regard parts of the Empire other than Canada if any of them were to claim that admission should be granted to their cattle. No such claim has, so far, been made except on behalf of Canada and no such claim seems probable, but if it were made it would have to be determined according to the circumstances of each case.

With regard to Canada, it has been suggested, as an objection to the admission of Canadian stores, that it is inadvisable that we should become dependent for the supply of store cattle on a source which might be cut off in time of war. The possibility of the supply of stores from Canada being barred in time of war, owing to the difficulty of transit across the Atlantic, may be relevant on the question of the policy of their admission, but we do not think that the terms of reference are such as to bring within our competence a question of broad Imperial policy of this description.

A great deal has been made in argument of pledges alleged to have been given by the Government to Canada that the embargo would be withdrawn. Evidence with reference to such pledges could not be excluded, for it might well be said that if the Government did give a pledge of this kind it would be some evidence that the thing itself was proper to be done. Our Commission, however, is to inquire on the terms of the reference whether it *is* a thing proper to be done, and we are bound to inquire and report on this point. We are not appointed to inquire whether the Government had pledged themselves to any particular course of action, but whether admission is advisable on the lines indicated in the reference.

It was strongly urged before us that the admission of Canadian stores would very much shake the confidence of home breeders in Great Britain and Ireland, and lead to the curtailment of breeding in the United Kingdom, so that in the long run, at all events, the admission would not be in the interests of this country. It was apprehended that confidence would be shaken in two ways: first, it was said that the apprehension of disease from the admission of Canadian stores was widely entertained; and secondly, it was said that there was a great dread of Canadian competition among home-breeders. With regard to the former of these two grounds, we shall deal with it in detail further on. With regard to the second, we desire to make the following observations. It was not contended in terms that the home-breeders should be protected against the competition of Canadian cattle, or that such protection was necessary for the breeding industry in England and Wales. Indeed, we do not read the terms of reference as requiring us to report upon a question of this nature. No evidence was adduced to show that such protection is necessary, but there was a great deal of evidence tending to show that apprehension on this subject is widely entertained in England, and that therefore the admission of Canadian cattle might have a prejudicial effect, by discouraging the breeding industry here, so that the apprehension might, in this way, tend to bring about its own fulfilment. If there be such a widespread feeling among English farmers as to the effect on home breeding of the admission of stores from Canada, its existence may have a great bearing upon the policy of putting an end to the embargo. For this reason, we think that the question how the proposed admission is regarded by the farmers cannot be ignored.

The question whether Canadian stores should be admitted is one on which there is great difference of view in the different parts of the United Kingdom and among different classes of the population. The considerations applicable to the various parts of the United Kingdom and to the various classes of the population are very different.

In England the balance of opinion among the farmers appears to be strongly against the admission. Resolutions were passed by all the branches of the National Farmers' Union, with the exception of the Northumberland branch, in favour of the maintenance of the embargo. It was, indeed, suggested that there are large minorities of the other way of thinking, but little evidence was forthcoming to this effect.

Opinion in London, and in the towns generally, appears to be in favour of admission, and to be based on the expectation that this would bring down the price of meat, and especially of fresh meat, very materially.

In Scotland the large towns also advocate the admission of Canadian stores, and the great majority of the farmers in Scotland, as a rule, take the same side. There is a great deal of high farming of an intensive character in Scotland and most of the Scottish farmers regard the feeding of cattle as

a necessary element in good farming, as they consume the root-crops, etc., and supply most valuable manure. A different feeling, however, prevails among the smaller farmers of the Highlands as they regard with great apprehension the competition of stores from Canada with stores bred on their own farms, on the sale of which their profits largely depend.

In Ireland the feeling is unanimous in favour of the maintenance of the embargo. The farmers there believe that its removal would be disastrous to them and might oust them from the market for their stores, of which they have now had the exclusive enjoyment for a great many years. We do not think that it is within our province to decide how far these apprehensions are well-founded, or to consider what might be the effect, from a political point of view, of such a change.

A good deal was said in evidence from Ireland as to the possible danger to the United Kingdom if the Irish farmers, on whom Great Britain has relied for stores, were driven out of this business by Canadian competition. It was said that, in time of war, stores could not be brought across the Atlantic; to this point we have already adverted. A similar difficulty might arise in the case of an outbreak of disease in Canada.

Other considerations of a political nature may arise with regard to Ireland. Ireland is, at present, an integral part of the United Kingdom, and the control of cattle in Ireland rests with the Irish Department of Agriculture, which is answerable to the Imperial Parliament and is represented there. The possibility that this state of things may cease has been touched upon in argument, but we think it is not for us to deal with such a question. For the purpose of this report, we must assume that Ireland will remain, as regards the control of the Irish Department of Agriculture, an integral part of the United Kingdom.

In framing our report we have had regard to the questions actually put to us, which are questions of fact and the answers to which must depend upon the evidence.

Effect on Meat Supply

Though no definite figure can be laid down with precision, it has been estimated that Canada would be able to ship 200,000 head of cattle annually for fattening in the United Kingdom, and that this amount might rise to something approaching half a million. For the purpose of estimating the effect of admission, 200,000 was generally taken by the witnesses as the probable supply, and we propose to deal with the question upon this basis.

It is extremely difficult to determine how far this amount would form an addition to the meat supply of the United Kingdom. To some extent it might merely replace stores raised in Great Britain or in Ireland. Assuming, however, that the 200,000 would constitute an addition of that amount to our meat supply, it must be borne in mind that this would be an increase of only 8 per cent relatively to the whole meat supply. Two and a half million beasts are, we are informed, slaughtered in this country every year, for the purposes of the meat market.

Sir Daniel Hall, the chief scientific official at the Ministry of Agriculture in London, stated that it is the price of chilled beef which, under normal circumstances, mainly determines the price of home-bred beef (1st day, Q. 83). Mr. Robbins, the President of the National Farmers' Union, said that even if the Canadian surplus of 200,000 could be diverted to this country at a cost substantially less than that of home-bred stores, he did not think that such an addition would affect very appreciably the price of our total supplies (3rd day, below Q. 1022). There were other witnesses who took the same view. On the

other hand, Mr. W. Smith, Convenor of the County of Forfar, who has dealt largely in cattle, said that Canadian stores would increase and cheapen the meat supply, though he could not say to what extent, as that would depend upon the prosperity of the country and the numbers that were sent (9th day, below Q. 4220); and evidence to the same effect was given by Mr. W. Maxwell, farmer and wholesale potato merchant in Forfar (10th day, below Q. 4492). It may be said of the Scottish witnesses in general that, however keen they were for the admission of Canadian stores, they refused to commit themselves to any figures with regard to the decrease in the price of beef to be hoped for as one result of their admission. Mr. J. B. Guild, a Fellow of the Royal Statistical Society and the Economic Society, said (17th day, Qq. 8527-8529) that if there were a large importation of stores, say, 200,000, there would be a temporary reduction in the price, owing to the alarm of English breeders, who would put their stores on the market, but that he did not think there would be a permanent reduction in price. In answer to questions put by Lord Askwith (18th day, Qq. 8779-8780) whether there were any data on which the temporary cheapening could be computed, he said that it was a matter of pure guess.

On the other hand, there were some estimates of the amount of reduction of price to be expected which appear to us to be quite extravagant. During the last election at Dudley, a statement was circulated that the admission of Canadian stores would reduce prices of beef by 6d. per lb., and this figure was supported by some witnesses called before us in favour of admission; we are quite unable to accept it.

Dr. Tolmie, the Minister of Agriculture for Canada, in his very clear and able statement of the reasons for the removal of the embargo (19th day, Qq. 9246-9666), laid no stress upon any reduction in the price of beef to the consumer.

We have also had the evidence of Lord Ernle on this point. He said (21st day, below Q. 10,697): "I do not myself believe that the importation would necessarily increase the supply or cheapen the cost of fresh meat." He added: "Even if the importation of Canadian cattle did increase supply and cheapen cost of fresh meat for a time, it would only do so for a limited period."

Upon the whole, we think it probable that the admission of Canadian stores would cause a slight reduction in the price of beef.

As to the extent of the reduction, it has been stated in evidence by Mr. W. H. Key, a witness representing the view that the embargo on cattle should be removed, that, from his experience as a wholesale meat salesman, an increase of 5 per cent in the supply in the market almost invariably resulted in a decrease of 10 per cent in the price (20th day, Qq. 10,367-10,370). If this canon were accepted, it would mean that an increase of 8 per cent in the supply would be followed by a reduction of 16 per cent in the price. We were unable to obtain data justifying this calculation. Mr. Key merely stated that he had found it so in his experience. We cannot accept the standard suggested as invariable. It is clear that an increase in the supply must have some economic effect upon the price. We cannot, however, indicate with any certainty the extent of that economic effect, because so many factors may arise to affect the result. Assuming that the demand remains constant, any temporary reduction or increase in the supply must, under normal circumstances, influence the price, and there is no doubt that the supply would, in course of time, adjust itself to the demand, and thus the reduction or increase in price, due to the excess of supply, or *vice versa,* would soon disappear. We are of opinion that the competition resulting from imported

stores, and the fact that a more regular supply would be available to the feeders in consequence of there being two sources of supply instead of one, would result in stores being procurable at a lower level of prices, and that this would, in course of time, be reflected in the retail price of fresh meat and bring down the price to a generally lower level. We discard speculations as to any immediate and temporary effect which the admission might have in bringing down prices. We think it quite possible that if a drop in price were caused by any nervousness in the market on the first admission of Canadian cattle, such a drop might be followed by a reaction in the direction of higher prices. We should, however, anticipate that ultimately, with Canadian stores coming in, prices would settle down on a level somewhat, but not greatly, lower than that which would prevail under the embargo.

Effect of Admission

The second question for our consideration is "Whether such admission is advisable, having regard to the necessity of protecting live stock bred in the country from the introduction of disease, and of restoring their numbers after the losses to which they have been subjected during or since the War."

The question is whether admission is advisable. We do not read this question as confining the grounds for admission to an increase and cheapening of the meat supply, but as intended to embrace any grounds connected with the production of food. We think that the terms of reference should be read liberally, so as not to exclude from the inquiry a matter which is highly relevant in itself and to which a good deal of evidence has been directed.

Sir Robert Greig, giving evidence on behalf of the Scottish Board of Agriculture, summed up in a few sentences the grounds for the admission of Canadian stores which he advocated: (2nd day, Qq. 428-432).

"(*Q.*) Taking the matter as a whole, and summing up what you have said, and the result of the consideration which your Board have given it, what do you say on the subject of the propriety of an augmented supply of store cattle, and its effect on the production of food and arable farming?—(*A.*) My Board's view is that an augmented supply of store cattle would increase the production of food both directly and indirectly, and would be to the advantage of arable farming and the consumers of the country as a whole. On the other hand, my Board is of the view that it would be to the disadvantage of the small farmer, that it would decrease his income, and that it might conceivably put a certain number of these farmers out of business; but the balance of advantage, in the opinion of my Board, is in favour of the importation of store cattle.

"(*Q.*) That is leaving out of account the question of disease?—(*A.*) Yes.

"(*Q.*) You have already referred, I think, to the necessity of larger supplies of store cattle for the grain and potato growing farms?—(*A.*) Yes.

"(*Q.*) As you have just said, steps would be desirable to stimulate the breeding of greater numbers of store stock in Scotland if the embargo is to continue?—(*A.*) I believe that to be absolutely essential if we are to maintain or increase the arable acreage. My view is that the arable farmer, if he sees in front of him an increased supply of store cattle, will increase his arable acreage.

"(*Q.*) Is the area of arable acreage in danger of declining under existing conditions?—(*A.*) The arable acreage is rapidly declining, I regret to say, and has been declining for many years."

This passage fairly represents the effect of a good deal of other evidence.

For intensive farming, such as prevails in Scotland, and in many parts of England, a sufficient supply of stores is essential, and it is for this reason that the importation of Canadian stores is desired so keenly by most Scottish farmers. For this purpose we think that the admission of Canadian stores is in itself desirable. It would appear that the number of cattle in Great Britain during the last 30 years has not increased in the same ratio as the population, but that on the contrary there has been a large relative decrease.

Alleged Danger of Disease

But, whatever the advantages of importation, the idea could not be entertained if there were danger of disease being brought thereby into the United Kingdom.

Is there any such danger?

The diseases of cattle most to be dreaded are Cattle Plague, Pleuro-pneumonia and Foot-and-Mouth Disease. It was on account of the supposed presence of Pleuro-pneumonia in certain Canadian cattle in 1892 that permission to import, except for slaughter at the port of landing, was first withdrawn for cattle coming from Canada. We have had a good deal of evidence with regard to those particular cattle, and there seems to be every reason to believe that they were not suffering from Pleuro-pneumonia at all, but from some other affection of the lungs with somewhat similar symptoms, which was mistaken for the deadly and dangerous Pleuro-pneumonia.

It is further, in our opinion, established that for the last thirty years, no Cattle Plague, Pleuro-pneumonia or Foot-and-Mouth disease has existed in Canada, and, indeed, there is no trace of any of them having appeared at any time in that country except in 1884, when two consignments from Great Britain were found to be affected with Foot-and-Mouth disease, both of which were dealt with at a quarantine station at Quebec, and the disease did not obtain a footing in Canada (19th day, 9th para. under Q. 9248). At present, Great Britain draws largely upon Ireland for stores, and Lord Ernle, although he gave his opinion against the admission of Canadian stores, said he considered the Canadian cattle healthier than the Irish (21st day, Q. 10,743).

We have had a great deal of evidence as to the health of the Canadian cattle, and in our opinion it established that they are healthier than the Irish, and indeed than the British. It has been repeatedly admitted by Your Majesty's Ministers that there is nothing to fear from disease among the Canadian cattle themselves.

It has, however, been urged by the advocates for exclusion that there is disease among cattle in the United States, and that the frontier is a very long one, so that diseased cattle might find their way across. But the Canadian frontier has been so guarded and policed that there has been no case of any such disease finding its way into Canada from the United States for the last thirty years, and, there is no record of anything of the kind at any time. The Canadian Government state that they are ready to adopt any additional precautions that can be suggested and, in our opinion, there is no appreciable risk of disease being set up in the stock of the United Kingdom by permitting the importation of Canadian cattle.

Canadian cattle are all branded with distinctive marks, and with ordinary care there seems to be little chance of United States cattle being sent to this country as Canadian cattle.

Quarantine

It was said by witnesses opposed to the admission of Canadian cattle that if they were admitted they should be subjected to a period of quarantine. It

appears clear, from Sir Daniel Hall's evidence (1st day, Q. 62), that a system of quarantine, in the first place, would be extremely expensive, and, in the second place, would so hamper the trade as to render the permission to import illusory. Sir Daniel Hall stated that "it would be absolutely impossible to continue to carry on a trade on a basis of quarantine." (Q. 62.) This is confirmed by Dr. Tolmie, the Canadian Minister of Agriculture. He was asked (19th day, Q. 9577) by Lord Askwith the following question:—

> "I understood you do not want quarantine between this country and Canada if these cattle were brought in here?"

to which he replied:—

> "It would make the store cattle business an impossibility."

We have given a great deal of consideration to this point, and it appears to us that quarantine in the case of Canadian cattle is unnecessary. The cattle are very healthy, and every precaution would be taken by the Canadian Government, as Dr. Tolmie stated, for thorough inspection before and during their transport to England. The sea voyage by itself could be rendered by suitable inspection equivalent to a period of quarantine. The Canadian Government have undertaken, through Dr. Tolmie, that the traffic will be confined to cattle born and bred in Canada, and that every possible precaution will be taken against the transport of diseased animals. It is obvious that if Canadian cattle are admitted, it would be highly in the interests of Canada herself to take care that all regulations for this purpose should be fully observed.

Lord Ernle's Evidence

Lord Ernle, after referring at some length to what took place at the Conference in April, 1917, gave his view of the present situation, and pronounced against the admission of Canadian stores (21st day, 8th para. under Q. 10,697).

> "If any substantial and clear advantage to the community could arise from the admission of Canadian stores, I should, personally, be willing to face whatever risk, if any, remained after taking all possible precautions. But the real question is, what the farmer would think. His capital is not large, and he has no margin outside what is invested in his business. He is necessarily cautious. Unless he has confidence he will not rear stock. That is, I think, a certainty. I do not believe that any man would venture to say that it is absolutely free from all risk to allow the importation of Canadian stores. It is at the highest a question of degree. I think the importance of that is this: The Government, in 1896, decided that safety, absolute safety, was secured by the prohibition of all stores, and I do not think the maintenance of that view can be regarded as a stigma on Canadian cattle, provided that we remove the imputation, which I think we may very well do, that they were excluded, because we were not reasonably satisfied that we were secure from risk. I think we might, and we ought to put it upon absolute safety, and, if I may venture to say so, I do not think that any country allows cattle to enter its ports or cross its frontiers in the wholesale fashion in which Canadian stores would have to enter this country; that is to say, they all impose severe tests, even on pedigree breeding cattle."

With most unfeigned respect for Lord Ernle, we are unable to concur with him upon this point. He says: "the real question is what the farmer would think." This passage strikes the keynote of the opposition, so far as England is concerned, to the removal of the embargo. The true question seems to us to be what the facts really are, while we fully recognize that what the farmers think may be a reason for some delay in taking action if Your Majesty's

Government think that this is desirable.

So far as these apprehensions rest upon belief in the danger of infection, they are in our opinion unfounded. So far as they depend on the dread of competition with stores bred in this country, we may point out that the cost attending transport of Canadian cattle from the West of Canada to this country must always be heavy,* and of itself necessarily have a considerable protective effect in favour of the home breeder, and we do not consider that the propriety of continuing the prohibition for the purpose of ensuring complete protection against competition falls within the terms of our reference.

Importance of Home Breeding

The home breeding of stores should certainly be encouraged, and no prospect of immediate advantage should lead this country into any course which, by diminishing or destroying the breeding industry here, would render it absolutely dependent upon oversea sources. It would be quite as much to the advantage of this country that it should be able to rear within its boundaries all the cattle required for the food of the population and for the efficient conduct of agriculture as that it should be able itself to grow all the corn required here for food. The advantage of this in time of war has been brought home to every one by the experience of the last few years. It is, however, clear that Great Britain (England and Scotland and Wales) cannot, under present circumstances, produce all the cattle wanted for the most effective tillage of the land and for food, and at present Great Britain to a great extent depends for the necessary supply of stores upon Ireland. So long as Ireland remains an integral part of the United Kingdom, the Irish Department of Agriculture is under the control of the Imperial Parliament and Government, and supplies from Ireland may, for this purpose, be treated as if produced in Great Britain. The supply of stores from Ireland was not interrupted during the war. But the Atlantic separates Great Britain from Canada, and it is possible that the supply of stores from that source would be impracticable in time of war. It has been urged by those who are against the admission of Canadian stores that if they were admitted they might drive Irish stores out of the market, and that Irish farmers might turn their attention to the production of fat cattle instead of stores, so that we should become entirely dependent on Canada for stores, which might fail us in time of war. It must, however, be a matter of uncertainty whether the competition of Canadian cattle would have this effect upon the Irish trade in stores.

We may point out that considerable inconvenience has recently been caused by the failure of stores from Ireland, owing to outbreaks of foot-and-mouth disease there, and it would obviously be of great advantage that there should be another source of supply for Great Britain. In this connection it was pointed out by the advocates of admission that if a trade in Canadian stores with this country should be developed, the Canadians would have every motive to improve the quality of their cattle, and for this purpose would naturally come to the United Kingdom for the purchase of pedigree bulls, in the supply of which the United Kingdom is admittedly foremost, and so this very important branch of agricultural industry might be substantially enlarged by the increased demand from Canada .

* See the evidence of Sir Daniel Hall (1st Day, Q. 119); of Prof. Wallace (2nd Day, Q. 641); of Dr. Tolmie (19th Day, above Q. 9,251); of Lord Ernle (21st Day, Qq. 10,936-10,937), and of Mr. P. E. Light (20th Day, Qq. 10,191-10,261; 21st Day, Qq. 10,945-10,961.

Highlands

In the Highlands there are some features which deserve special consideration, as bearing on the effect which the admission of Canadian cattle might have upon the crofters and small farmers.

We desire to refer on this subject to the letter of the 23rd June, 1921, sent by the Marquess of Graham, as President of the Highland Cattle Society of Scotland, and set out in the evidence of the 19th day (immediately above Q. 9246), the material part of which is as follows:—

"As President of the Highland Cattle Society of Scotland, I am desired to communicate with you on the above subject, and to say that the general opinion of our members appears to be against the importation of live cattle from abroad. Our members are of opinion that it is desirable to encourage by every means the breeding of stores in the Highlands and Islands from our native breeds and crossed with healthy stock suitable for low ground grazing. We are of opinion that imported cattle from Canada or elsewhere would be quite useless for grazing in the Highlands, and that any measures which discourage the raising of home stores would seriously prejudice the living and agricultural interests of the crofters and other small farmers of Scotland."

We also call attention to the following resolution which we are informed has been adopted by more than 100 Crofters and Small Farmers' Associations in Scotland:—

"We, the members of the '(society named)' representing the interests of all the crofters and small holders in the district, emphatically protest against the removal of the present restrictions on the importation of cattle from abroad. We are totally dependent on our crofts, and the chief source of our income is from the sale of our young cattle, which are sold as stores to the big arable farmers in the Lowland counties. If the restrictions on the importation are removed our chief means of livelihood would be seriously endangered."

This resolution was quoted in a statement in writing made by Mr. C. M. Bruce, of Forres. He was prevented by illness from attending before us, and the Commission accepted this statement as his evidence. The following passage may be cited from it:—

"All whom I have consulted are unanimous in support of the embargo remaining, otherwise they view the future with grave misgiving. In several instances I was told that heifers they had kept for breeding cows, had not been served this year, but would be sold in the autumn to the feeders. When I asked them not to despair they pointed out that they had no organization to speak for them while the wealthy feeders of the Lowlands, the meat traders and others were well represented. I found that even the suggestion of any change caused something approaching a panic. They asked since there were so many ex-service men among them would this have no influence in their favour. Down towards the Lowlands the crofter and small farmer has more strings to his bow. His mode of farming is different and he being nearer the markets can trust more to the side products for part of his living. Here also the dread of being knocked out by Canadian competition is general. They all depend on the calves paying the rent and manure bills, while the other products keep the home. They could not carry on without the profits obtained from calf rearing."

Reference may further be made to the evidence of Mr. W. R. Ross tending to show that the admission of Canadian cattle would be to the Highlands

a calamity (8th day, Q. 3579), and to the evidence of Mr. Macnaughton, who, speaking from a wide acquaintance with the central Highlands, said that the admission would throw much of the land there out of cultivation (8th day, Q. 3626). On the 8th day, at Q. 3478, will be found the evidence of Mr. D. McLaren, who spoke of the serious consequences which admission would have upon the large district between Dunblane and Oban, in which he said the opinion was unanimously against admission. Mr. James McTaggart, of Oban, member of a firm of large cattle salesmen in the West of Scotland, who spoke for the smaller class of crofters and farmers in the West Highlands and Islands, gave evidence as to the improvement that had been effected in cattle breeding in the West Highlands, and as to the disastrous effects which, in his opinion, would follow on the admission of Canadian stores. (16th day, Q. 8162.)

Sir Robert Greig, while he thought the admission of Canadian stores would, on the whole, be for the benefit of agriculture in Scotland, said that in some instances their admission might bear hardly upon farmers. On the 2nd day (Q. 407) he said:—

> "If the Canadian or any other store were imported in very large numbers, it is quite conceivable that some of those up-land farmers, in fact it is certain that some of those up-land farmers would find their profit reduced, and it is even conceivable that in some instances some of those up-land farmers would go out of business or would go in for some other kind of farming and refrain from breeding store stock.
>
> "(*Q.*) Do you mean they would devote the land to sheep?—(*A.*) I say it is conceivable. Personally, I take the view that very little of that would happen, but it is arguable that the price might fall to such a level that certain store farms would go out of cultivation, or at least would go out of the business of producing store cattle."

While he thought that the danger of diminution in the production of store cattle in Scotland, from the importation of store cattle from abroad, is not very grave, he added (Q. 410):—

> "I think that some farmers, situated in difficult circumstances who are just able to make ends meet when the price of store cattle is high, might have the balance set against them and be thrown out of business."

He summed up his evidence on this point as follows (Q. 415):—

> "I consider that balancing one advantage with another, taking into account the disadvantage to the up-land farmer and the possibility that the introduction of store cattle will discourage the up-land farmer to some extent in his business of breeding stores, still, the balance of advantage to Scottish agriculture is in its favour; the balance, when you regard the increased production of food, is still more in its favour; and the balance to the consumer is even further, I think, in its favour."

Upon the whole, we think there is reasonable ground for apprehending that the admission of Canadian stores might have a prejudicial effect upon the welfare of the crofters and small farmers in the high-lying grounds in the Highlands.

Ireland

There appears to be no division of opinion in Ireland on this subject. All parts of Ireland are agreed in thinking that Canadian stores should be excluded from the British market. Indeed, it is obvious that if Irish stores now sent to Great Britain were replaced to any great extent by Canadian stores, it might have a serious effect on Ireland, except so far as it might lead to the substitution of the sale of fat cattle for the sale of stores.

Restoration of Herds

With regard to the subject of the restoration of the number of our home herds mentioned in the latter part of the second question in our terms of reference, it is, we think, established that our herds in the main kept up their numbers in spite of the war, and that the diminution which took place latterly was due to the excessive slaughter of calves, resulting principally from the great demand for veal and the high price of milk. We see no reason to think that this excessive slaughter of calves will continue.

Sir Daniel Hall, in his evidence (1st day, Qq. 70-75, 139-140, 189-190), expressed great apprehension as to the effect of the want of confidence which he thought might be created in English farmers by the admission of Canadian stores. He thought that this might lead them, instead of rearing their calves, to sell them to the butcher. Any opinion expressed by Sir Daniel Hall is, of course, entitled to the most respectful consideration, but we cannot help thinking that the apprehensions entertained by him on this point are somewhat exaggerated. We cannot think that the farmers of England would regard the admission of Canadian cattle as a signal that they must give up the endeavour to carry on their business as hitherto.

We have already dealt with the question of confidence on the part of the English farmers, and we venture to anticipate that the restoration of the numbers of the herds will go on. In our opinion, the importation of Canadian cattle would not interfere with the restoration, on the contrary, we think it would probably help the restoration by bringing a larger supply of healthy cattle within the reach of farmers. The contrary view rests on the assumption that the farmer, in his dread of Canadian competition, might abandon breeding and rearing in despair.

Fluctuation in Supplies

A great deal was said in argument before us and by Mr. Robbins in giving evidence on behalf of the National Farmers' Union as to the risk that the supply of Canadian stores might fluctuate greatly in amount. We can find no solid ground for this apprehension. Of course, the rigour of the Canadian winter is to be reckoned with, but there is no reason to think that a supply sufficient to meet the demand would not be regularly forthcoming.

The grounds on which Mr. Robbins based his statement as to irregularity of Canadian supplies were three (3rd day, 8th para., below Q. 1022).

(1) The competition in the market of the United States. Canada and the United States are contiguous, and the United States may in the future consider it to their interest to encourage instead of discouraging, as at the present moment, the importation of Canadian stores. It cannot, however, be assumed that there would be frequent changes in the policy of the United States in this matter. We do not think that the possibility of difficulty arising in the future from action by the United States with regard to Canadian stores is a sufficient reason for not taking any course which present circumstances may indicate as desirable.

(2) The second ground for apprehending irregularity in Canadian supplies was based on the figures as to the number of live stock in Canada year by year, which Mr. Robbins says show wide fluctuations in comparison with those of the United Kingdom. This appears to be the case. A comparison of the figures shows that there has been greater fluctuation in the number of cattle in Canada than in the number of cattle in the United Kingdom. In the years

1907-1910 (both inclusive), the numbers of cattle in Canada were respectively, 7,131,816, 7,547,582, 7,234,085 and 7,114,914. In 1911, the number dropped to 6,533,436. In 1912 it was 6,431,861, and in 1913 6,656,121. In 1914, the number dropped to 6,036,817, and in 1915 it was only slightly larger—6,066,001. In 1916, it rose to 6,594,151, and in 1917 to 7,920,940. In 1918 there was a considerable increase, the numbeing 10,045,867, in 1919 the number was 10,085,011, and in 1920 it was 9,477,380.

These numbers are not as steady as the numbers in the United Kingdom, but we can see nothing in them to justify the apprehension expressed that the supplies could not be regularly kept up.

Mr. Robbins contended that it had been found by experience that we can get regular supplies from Ireland, and that they were not likely to be so regular from Canada, but we do not think that he succeeded in making this good (3rd day, Qq. 1113-1125).

(3) The third ground upon which Mr. Robbins thought the Canadian supplies would fluctuate is the fact that in Canada the conditions of transport favourable for this trade last only for a limited number of months each year. It is not easy to see why a breakdown of communication in Canada or over the Atlantic should be apprehended in the autumn, at which season the bulk of the Canadian stores would probably be shipped. There might, of course, be an occasional breakdown, but this is incidental to any long line of communication.

In one of the minority reports of the Inter-Departmental Committee on Meat Supplies (Cmd. 456, 1919) there will be found, at page 27, a very clear summary of the reasons against the admission of Canadian stores. We have already dealt with all the grounds there urged for the exclusion of Canadian cattle. We desire now only to add that we can see no sufficient grounds for the conclusion stated in the paragraph last but one in that report.

> "It appears to us, however, that if Canadian stores were re-admitted the numbers reaching this country would be small, uncertain and variable."

The evidence which was called before us seems to establish the contrary. We may refer especially to Dr. Tolmie's evidence given on the 19th day (under Q. 9250, "(*d*) Possible Supplies from Canada"), and we cannot regard as well-founded the fears expressed on this subject by Mr. Gill in his evidence on the 4th day ("Uncertainty of Canadian Supplies").

Lord Chaplin's Evidence

We desire to express our obligation to Lord Chaplin, for the statement which he gave us of the grounds for maintaining the prohibition against Canadian cattle, and for the evidence which he gave in answer to questions put to him upon this statement. With a great deal that Lord Chaplin said as to the evils of indiscriminate admission we are in agreement. We regret, however, that on the subject on which he speaks with such unique authority we feel unable upon this reference to accept his conclusions against the admission of Canadian cattle. We have endeavoured to give in detail our reasons for venturing to differ from Lord Chaplin upon this subject, confining ourselves to the terms of reference and not entering upon wider questions of policy on which his views may rest.

Milk

A good deal of evidence has been directed to the question of the effect which the importation of Canadian

cattle might have upon the milk supply. It is impossible to overestimate the importance of milk as part of our food supply, and it would be a fatal objection to the admission of Canadian cattle if it were the case that the admission would have a bad effect on the supply of milk.

Sir Daniel Hall took the view that the importation of Canadian cattle might lead to excessive slaughter of calves and that consequently fewer heifers would be reared to become milch cows (1st day, Qq. 71, 72 and 171). We have already dealt with the question of possible slaughter of calves under the heading of "Restoration of Herds," and have given our reasons for venturing to differ from Sir Daniel Hall upon this point. We do not think that prejudice would be caused to the milk supply in this way.

Lord Astor, who appeared before us as a witness on this part of the case, had been Chairman of the Committee on Milk Production and Distribution (Cmd. 483 of 1919). He gave it as his view (15th day, Q. 7244) that only the best dairy cattle should be imported, and was apprehensive as to the effect which the introduction of Canadian cows and heifers might ultimately have on the milk of this country. Mr. Henderson, on the other hand, thought that Lord Astor's evidence showed a want of appreciation of the views of the practical farmer, who looks out for an animal suitable for milk production and beef production as well. (15th day, Q. 7791).

Sir Robert Greig, of the Board of Agriculture for Scotland, took the view that the removal of the embargo would give us more milk and cheaper milk (2nd day, Q. 514), and, having regard to the admittedly excellent health of the Canadian cattle, this seems to us to be a reasonable view. It is proved by a number of witnesses that the Canadian cow is less liable to tuberculosis than English or Irish cattle (see the evidence of Mr. Cochrane, 12th day, Q. 6290), and this was borne out by the account given us by Alderman Hornby of the complete freedom from contagious disease in the Canadian cattle imported to Manchester between 1896 and 1911 inclusive (18th day, Q. 9170). Reference may also be made to the evidence of Mr. Chapman, representing the Live Stock Traders' Association. (13th day, Q. 6667).

The Liverpool and District Cowkeepers' Association whose members own about 7,000 head of cows, were represented by Mr. Foster (23rd day, Q. 11,504), who said that admission would make our milk supply purer.

Upon the whole, there is no reason for thinking that the importation of Canadian cows or heifers would affect our milk supply prejudicially; and, having regard to the healthiness of Canadian cattle, we think that an improvement might result.

CONCLUSIONS

The conclusions at which we have arrived are as follows:—

(1) We are of opinion that the admission into the United Kingdom of Canadian cattle for purposes other than immediate slaughter at the ports, would tend to increase the meat supply of the country to some extent, but it must not be assumed that the increase in the meat supply would necessarily be equivalent to the whole number of cattle so admitted, as it is possible that some of them might merely replace stores raised in Great Britain or Ireland.

(2) We think that such admission would tend to cheapen, in some measure, the meat supply of the country, but there are no data on which the extent can be accurately gauged. We think, in the long run, the tendency would be to bring prices to a level somewhat, but not greatly, lower than that

which would prevail if the embargo were maintained.

(3) We think that the importation of Canadian stores would tend to satisfy in some measure the increasing demand for fresh home-fed meat.

(4) We are of opinion that such admission is advisable, as providing another source for supply of stores for the purpose of scientific agriculture, with a consequent increase of the food supply.

(5) We are of opinion that there is no substantial ground for the apprehension that such admission would introduce disease among the cattle in this country.

(6) We are of opinion that such admission would not interfere with, but would tend to promote the restoration, and, indeed, the increase of the numbers of live stock in this country after any losses sustained during or since the war.

(7) We are of opinion that the introduction of Canadian cattle would not have any prejudicial effect upon the milk supply of this country, but would, on the contrary, tend to its advantage.

(8) We find that there is a general feeling among English farmers against the admission of Canadian stores. So far as this is created by the apprehension that disease may be thereby introduced, we consider it unfounded. So far as it is based on the view that the prohibition should be kept up for the protection of the home breeding industry against competition, we do not think that the question of such a policy falls under the terms of our reference. As we have pointed out, the cost of transport to England in itself forms a considerable measure of protection to the home breeder.

(9) We are of opinion that the admission of Canadian stores might make it difficult for crofters and small farmers in the Highlands to carry on their farming operations successfully owing to competition with them in the market for the sale of stores.

(10) We are of opinion that the admission of Canadian stores might to some extent deprive the Irish farmers of the market which they at present enjoy in Great Britain for their stores.

(11) We have not thought it within the terms of reference to enter into questions of Imperial policy as regards the food supply of the country in time of war, protection of home industries, or the effect of possible political changes in the Constitution of the United Kingdom.

We desire to express our sense of great obligation to our Secretary, Mr. A. W. Cockburn, Barrister-at-Law, for his invaluable assistance in the conduct of the Inquiry, and in dealing with the great volume of evidence, both oral and documentary.

All of which we humbly submit for Your Majesty's gracious consideration.

FINLAY. (L.S.)
ASKWITH. (L.S.)
ALGERNON F. FIRTH. (L.S.)
A. E. SHIPLEY. (L.S.)
W. H. PEAT. (L.S.)

A. W. COCKBURN,
Secretary.

Dated the 30th day of August, 1921.

PART I

Dominion Department of Agriculture

LIVE STOCK IMPROVEMENT MEASURES

Efforts of the Dominion Live Stock Branch for the Improvement of Canada's Herds and Flocks

BY R. S. HAMER, CHIEF CATTLE DIVISION

THE work of the Cattle Division of the Live Stock Branch of the Dominion Department of Agriculture has for its object the improvement of the quality (1) of breeding stock, both beef and dairy, and (2) the production, through better breeding and feeding, of superior quality in animals intended for the butcher's block. Considerable progress has already been made towards the attainment of these ends through the "Distribution," "Free Freight," and "Car Lot" policies of the Branch, particulars of which may be summarized as follows:—

Distribution of Pure-bred Bulls

The Live Stock Branch has been loaning pure bred bulls to specially organized associations in newly settled districts and in backward sections in the older provinces since 1913. The number of bulls so loaned up to August 15, 1921, was 3,408.

Up to 1920 all bulls loaned were purchased direct from breeders, it having been considered that for the Branch to invade even the larger sales with its heavy annual requirements would lead to complaint from private bidders. In 1920, however, it became apparent that the breeders entering bulls in the Provincial sales in Western Canada were entitled to more support than they were likely to get from private demand in view of the unusual conditions prevailing. It was, therefore, decided to give all the support possible to these sales by endeavouring to supply requirements from this source. The step proved most opportune and during the past two years the Branch has been able to secure an excellent lot of bulls at good values. The support given has been highly appreciated by contributors to the sales as it has unquestionably been instrumental in maintaining a good average price on the better bulls offered. At seven sales held in Western Canada in 1920, 225 bulls were purchased by the Branch and this year 236 were purchased at western sales. In addition, the Branch patronized this year one sale in Ontario and one in Quebec.

In the following table will be found the total number of bulls purchased for each province under the Distribution Policy during each year of its operation:—

	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	Maritime Provinces	Total
1913	3	20	33	27	11	0	0	94
1914	9	78	116	26	33	111	39	412
1915	21	76	124	28	53	170	45	517
1916	32	81	76	35	13	200	25	462
1917	22	71	70	37	39	165	13	417
1918	19	67	43	32	27	51	15	254
1919	13	104	77	35	41	62	44	376
1920	20	147	104	29	30	109	16	455
1921	23	111	109	84	30	60	4	421
	162	755	752	333	277	928	201	3,408

Car Lot Policy

Under the terms of this policy the Live Stock Branch pays reasonable travelling expenses of farmers residing in Canada who purchase stock at central stock yards for return to country points. In Eastern Canada the assistance rendered is confined to purchases of female breeding stock—cattle, sheep or hogs. In Western Canada the policy covers stocker and feeder cattle in addition to breeding stock. Purchasers are required to fulfill certain requirements of the Department in connection with their shipments, and to give satisfactory assurance that none of the stock is being purchased for speculative purposes.

This policy has proved a very valuable educational agency in that its terms have encouraged farmers from all over the country to visit the stock yards and to become acquainted with methods of doing business at these points. It has also played a very important part in encouraging a return of unfinished cattle and sheep to country points for further feeding, and in the return of young female breeding stock, particularly from yards in Western Canada.

The policy has been in effect at the stock yards of Western Canada since the fall of 1916. On the yards at Toronto and Montreal it has been in effect only since May, 1918. Total shipments made each year under its terms are given in the following table:—

CAR LOT POLICY SHIPMENTS TO JANUARY 1, 1921

Year	Steers	Heifers	Sheep
1916 (3 months)	6,208	3,113	1,407
1917	11,334	10,411	1,800
1918	20,703	18,745	7,978
1919	22,490	17,550	9,408
1920	14,009	7,957	6,317
Total	74,744	57,776	26,910

The policy has not been an expensive one as is indicated by the fact that the cost to the Department of all cattle shipped under its terms during a period of three years averaged only 59 cents per head. The average cost of all sheep shipped during the same period was only 18⅓ cents per head.

Free Freight Policy

The Free Freight Policy, which has been in operation since the fall of 1917, was inaugurated by the Live Stock Branch in co-operation with the railway companies of Canada, with a view to preventing, as far as possible, the slaughter or exportation of useful heifers, young ewes and young sows offered for sale on the open market at the central stock yards. Under this policy, farmers are entitled to ship from stock yards to country points female breeding stock, of the classes mentioned, without payment of freight charges on same, provided the stock was not purchased for speculative purposes.

During the time the policy has been in operation it has been very widely taken advantage of by farmers anxious to secure breeding stock, and it has unquestionably been one of the most important factors in promoting the return to country points of a large percentage of useful females offered on the yards at Edmonton, Calgary and Winnipeg. Since the inception of the policy in September, 1917, shipments under its terms from the different yards, up to January 1, 1921, numbered as follows:—

Name of Yard	Heifers	Ewes	Sows
Edmonton	24,086	8,561	155
Calgary	21,949	32,513	.....
Winnipeg	20,097	9,206	203
Prince Albert	51	160	.....
Moosejaw	61	.....	.....
Toronto	1,872	10,084	.....
Montreal	164	452	11
Total	68,280	60,976	369

Shipments for the twelve months ending January 1, 1921, were 9,742 heifers and 10,964 ewes.

DISTRIBUTION POLICY FOR PURE-BRED RAMS AND BOARS

BY A. A. MacMILLAN, CHIEF SHEEP AND SWINE DIVISION

THE distribution policy has now been in operation for eight years. Assisted by the "Premium" policy, it has encouraged many farmers throughout the Dominion to purchase pure-bred rams. It was not, therefore, considered necessary to encourage the extensive loaning of rams or boars during the past year, and consequently few new rams and boars were distributed. Greater discrimination was exercised in dealing with new applications, and only those were accepted that came from districts where returned soldiers were settling, and from newly settled districts, or districts where improvement of sheep and swine was considered essential. A number of the rams and boars already loaned had either outlived their period of usefulness or had been two years with associations. The older animals were sold for the block, and those that gave evidence of further usefulness were either sold for breeding purposes, exchanged between associations, or transferred to new associations whose applications had been accepted. The rams loaned have effected a decided improvement in the breeding of the flocks and quality of the market lambs in which they have been used and as a result of their use farmers who are now in reasonably good circumstances are willing to purchase a ram in the regular way. In view of the recent development of interest in swine raising there is an increasing demand for the loan of boars in districts that are now passing from out and out grain farming to mixed farming with more livestock. Settlers in such districts are for the most part new to the raising of swine and the distribution of boars in such districts has particular value in improving the bacon type of hog.

STATEMENT OF RAMS LOANED UNDER DISTRIBUTION POLICY

Province	Oxford	Shrop.	Leic.	Linc.	Hamp.	Cheviot	Suffolk	Total
Quebec	50	110	137	1	33	10	..	341
Ontario	15	15	30	7	..	..	..	67
Manitoba	56	9	3	..	..	..	..	68
Saskatchewan	1	..	1	..	..	..	..	2
Alberta	6	18	..	..	..	..	..	24
British Columbia	3	..	..	..	..	..	1	4
Total	131	152	171	8	33	10	1	506

STATEMENT OF BOARS LOANED UNDER DISTRIBUTION POLICY

Province	Berk.	York.	Duroc.	Chester	Tam-worth	Poland, China	Total
Prince Edward Island	2	..	..	..	..	..	2
Nova Scotia	..	2	..	..	..	..	2
New Brunswick	1	..	..	..	..	..	1
Quebec	..	24	..	8	1	..	33
Ontario	1	10	..	..	..	..	11
Manitoba	5	2	..	..	..	..	7
Saskatchewan	5	..	4	..	..	..	9
Alberta	10	1	5	..	..	1	17
British Columbia	6	1	2	1	..	..	10
Total	30	40	11	9	1	1	92

Premium Policy

Under this policy the first premium has been paid on six hundred and nineteen applications, and the introduction of this number of pure-bred rams for the first time on farms throughout the Dominion has proved to be one of the most effective means of eliminating the scrub ram and improving the quality of market lambs. The clause covering docking and castrating under this policy has also been a very effective means of bringing about the general trimming of lambs, especially in the districts that were most backward in this regard. As a result of requests and the consequent holding of many demonstrations in docking and castrating, it was possible to reach not only farmers that had received the bonus, but many others as well, thus educating them to the benefits of these operations. Inspections were made or reports received on all flocks affected by the policy and with few exceptions the conditions were complied with. Applications for the year 1921 will be in the neighbourhood of 500.

The following table gives the number of applications for premiums received from each province, indicating also the breeds of rams purchased:—

Breed	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Shropshire	22	21	19	84	27	1	..	11	2
Leicester	9	1	13	62	12	1	1	..	..
Oxford	6	13	35	71	74	10	6	13	2
Hampshire	2	5	7	31	..	1	..	..	2
Lincoln	2	..	3	2	6	..	..	..	..
South Downs	4	..	..	..	..	..	..	..	..
Cotswold	1	1	2	1	2	..	..	..	..
Cheviot	..	1	9	10	1	..	..	..	..
Dorset	..	..	5	..	5	..	..	..	..
Suffolk	..	..	..	..	..	..	1	1	1
Total	46	42	93	261	127	13	8	25	7

REPORT ON COW-TESTING, 1920

BY A. H. WHITE, SENIOR DAIRY PROMOTER, DAIRY AND COLD STORAGE BRANCH

THE cow testing work in 1920 was carried on under the same general plan as during the past two years. There was an increase in the total number of herds and cows under test, and the largest increase was in the province of Quebec where the provincial authorities put on a campaign for this work through their Dairy Inspectors. The work, however, was increased in several other provinces and is becoming a permanent practice on many dairy farms.

In each province, the local Dairy Promoter has been carrying on some special work, generally with the co-operation of the Provincial Dairy Branch, to foster and increase this work in the dairy districts, and they have met with some measure of success. However, the regular work of organizing and supervising the work took up most of the time of each Dairy Promoter. A brief review of the work in each province during the season of 1920 will be found in the following paragraphs.

The work in Alberta received a setback when the Promoter in charge resigned, and for two months there was no one to look after and organize the testing centres there. However, the men who realized the value of the work remained in the testing centres and after a new appointment was made, a new impetus was given to the work and several new testing centres were started.

In Saskatchewan, there was a slight decrease in the number of herds and cows under test, but this was due, somewhat, to the severity of the previous winter, and the farmers were rather backward about testing their cows because they were in such poor condition. The Promoter in that province did a lot of pioneer educational work in the southeastern portion of the province while travelling on the Better Farming Train organized by the Provincial Department of Agriculture. This work consisted largely in giving lectures and demonstrations at the different stops along the line, and great interest was manifested. Previous to last winter, there had been practically no educational work done at all in this section of the province. Later on in the summer, the district was again visited, a few testing centres were organized and the farmers instructed on the care of milk and cream. The Dairy Tests at several fairs were also supervised at the request of the Fair Committees. These short tests are becoming popular as a basis for judging dairy cattle in milk. A Greater Average Production Contest, organized by the Provincial Dairy Branch of Saskatchewan but based on records received at the Dairy Branch, Ottawa, and at the factories, was carried on among the farmers of the province and some time was devoted to this work.

The Extension Service of the Department of Agriculture, Winnipeg, assisted the cow testing work in Manitoba by introducing a cow testing project in connection with the Boys' and Girls' Clubs organized throughout the province. There is a great deal of promise in work of this kind as it is much easier to reach the boys and girls than the "grown-ups."

In Ontario, there was a slight increase in the work but there should be many more herds under test. A large number of farmers are keeping records for themselves but when compared with the total number of farmers in the province, the percentage is very small. There are a number of good herds in the province but there could be many more if the farmers would use more generally the cow testing association to increase production in the average grade herd. Dairy Tests at several fall fairs and at the Ottawa Winter Fair were supervised by the Promoter in charge of the work in the province.

The main feature of the work in Quebec was the campaign carried on by the Provincial Department to increase the number of herds under test. This campaign was carried on during the month of March by the Dairy Inspectors and was highly successful as evidenced by the number of farmers who agreed to put into practice the keeping of dairy records. The actual number of herds and cows recorded was increased by over 100 per cent and might have been more, had the supply of scales and bottles equalled the demand. There were over 22,000 cows recorded for part of the season and a great many for the full year. The need in Quebec is for the farmers to realize the importance and value of

keeping records for the full year, and not for only three, four or five months as a great many do.

In Nova Scotia, cow testing and better dairy methods are being fostered in several ways. In co-operation with the Educational Department, a school essay competition was carried on during the year. This was to encourage the school children and interest them in better dairy methods. By the kindness of Creamery Managers, their patrons were constantly reminded of this work, by short mottos or sentences stamped on their monthly cheques. Better and more abundant feeding was advocated strongly last spring, and by getting a number of farmers to sow small areas of oats, peas and vetches, the value of this crop was demonstrated in a very practical way. The farmers who sowed this crop last year realized the importance of some such soiling crop and are planning to sow larger areas this spring. Another method of reaching the people was by means of a booth at several fall fairs. Practical demonstrations and charts on cow testing helped to bring this matter to the attention of a great many farmers.

In New Brunswick, the work was carried on in the regular way. Some difficulty was experienced in getting capable men to do the testing at the different centres, but the number of cows under test was increased to a small extent. Lectures and short course work in co-operation with the provincial authorities were included in the work performed.

In Prince Edward Island, a Dairy Herd Competition was carried on and based on the records kept according to the rules of the Dairy Branch, Ottawa. Quite a number of farmers are entered in the different classes in this competition.

In the prairie provinces where dairying is as yet only considered a side line in a great many districts, the work of the Dairy Promoter is largely one of propaganda and education. In many sections it is real pioneer work, and although no tangible results are immediately apparent, it is essential to bring this work to the attention of these districts for the benefit of the dairy industry at large. This educational feature of the work also applies to certain sections of the maritime provinces and of Quebec.

However, in Ontario and the older sections of Quebec, it is a matter of getting the farmers to take up cow testing as a means of herd improvement. Nearly every district in Ontario has had a practical demonstration of the value of this work and yet very few farmers seem to feel the need of it in their own business. Cow testing is not only essential to building up a dairy herd—it is also needed to keep up a standard of production already reached. There are always some poor producers to be found in every herd, and they can only be eliminated when records are kept and production is known.

A bulletin on cow testing, No. 58, Dairy and Cold Storage series, was published during the year giving a report of the work during 1919 and also showing how the work had progressed during the past few years. A questionnaire was also sent out asking for information regarding kind of sire used, cost of feed during the year, etc., and the following is a brief summary of the information contained in the answers from farmers all over the Dominion who have had some experience with Dairy Records. Although these questionnaires were sent to all farmers who have sent in records, not more than 25 per cent returned them fully filled in.

There are many grade sires still being used in the dairy herds of Canada. Out of a total of 446 farmers who replied, 134 were using grade sires, 151 farmers had been using pure bred sires for less than five years and 159 had been using them for more than five years. It is safe to say that if all questionnaires had been answered, the percentage of grade sires would have been much greater.

The men who have been using pure bred sires for five years and who have been keeping records for three years or over, all report increases in production of 30 to over 100 per cent. This is significant, because if the production of the average dairy herd is to be increased, and the quality of the stock improved, it is imperative that pure bred sires be used and that a continual weeding out of the poor cows takes place.

The large proportion of farms are not equipped with silos, showing that adequate provision is not made for a supply of succulent feed for winter. There were only 92 farmers reported having silos and more than half of these were in Ontario. To date, the silo has not been used very extensively by the dairymen of the prairies and the maritime provinces. However, now that it has been demonstrated that sunflowers can be successfully grown and made into silage in nearly every part of the prairies, reports show that many farmers are contemplating building silos. This is also true in the maritime provinces where oats, peas and vetches are used for a silage crop.

The majority of farmers kept no feed records. Most of them estimated an average feed cost per cow, while a few had no idea at all what it cost to feed their herd during the season. It is absolutely essential, if full particulars of the business of the dairy are to be had, that feed records as well as production records, be kept. The widely varying feed costs which were estimated by the farmers seem to point to the fact that some men are feeding more than should be fed for economical production while others are doing the reverse and feeding too stintingly. The estimated feed costs ranged from $40 per cow per year to over $140, while the average for all was $82. Many farmers also reported having disposed of several of their poor cows to the butcher and these are on the right path to increased production. But these answers still indicate the great need of more pure bred sires, more silos to insure a plentiful supply of milk-producing food, and more attention given to the matter of carefully keeping feed and production records.

The following tables will give a concise statistical summary of the work in the different provinces during 1920. These figures are very general and do not go into detail, but will give some idea of what is being done to assist the farmer with the grade herd to put that herd on a more efficient basis. This is done by showing up the poor cows so that they may be "weeded out," and also by the selection of the best producers which can be used for breeding stock.

A great many farmers have been helped and aided in building up a herd of high producing individuals by keeping dairy records. But a great many more should avail themselves of this help offered by the Dairy Branch, Ottawa.

TABLE I — HERDS, COWS, TESTING CENTRES, SAMPLES TESTED AND AVERAGE SIZE OF HERDS

Province	Number of Herds	Number of Cows	Testing Centres	Number Samples Tested	Average Size of Herds
British Columbia	24	102	5	610	4.2
Alberta	38	515	24	3,124	13.5
Saskatchewan	71	668	18	3,155	9.4
Manitoba	78	580	23	2,214	7.4
Ontario	446	4,911	66	20,835	11.0
Quebec	2,474	22,229	353	87,594	8.98
New Brunswick	180	1,177	18	4,245	6.5
Nova Scotia	372	2,224	39	11,876	5.9
Prince Edward Island	164	976	18	5,765	5.9
Total and averages	3,847	33,382	564	139,418	8.67

The foregoing figures show that Quebec has the majority of herds and cows under test, which was due to the work done during March by the Dairy Inspectors of the Provincial Department of Agriculture.

Although records were received from the 3847 herds for some part of the season, a large number were only in for a few months and did not receive the full benefit of the work. Dairy Records will serve the farmer best when complete for each cow for the full year.

TABLE II—NUMBER OF HERDS AND COWS TESTED IN 1919 AND 1920 BY PROVINCES

Province	Herds		Cows	
	1919	1920	1919	1920
British Columbia	34	24	215	102
Alberta	64	38	820	515
Saskatchewan	74	71	773	668
Manitoba	83	78	1,035	580
Ontario	417	446	4,214	4,911
Quebec	1,046	2,474	10,374	22,229
New Brunswick	250	180	1,065	1,177
Nova Scotia	207	372	2,714	2,224
Prince Edward Island	241	164	1,307	976
Totals	2,416	3,847	22,517	33,382
Increase	1,431 herds			10,865 cows

TABLE III—AVERAGE PRODUCTION BY PROVINCES OF ALL COWS RECORDED FOR THE FULL YEAR 1920

Province	No. Herds	No. Cows	Average Production		
			Lb. Milk	Test	Lb. Fat
British Columbia	10	38	7,421	3.9	289.9
Alberta	13	186	7,046	3.4	239.7
Saskatchewan	10	114	5,292	3.7	199.8
Manitoba	7	101	5,398	3.5	192.1
Ontario	65	540	7,094	3.5	248.8
Quebec	196	1,752	4,659	3.8	179.2
New Brunswick	28	156	5,010	3.9	194.6
Nova Scotia	105	624	5,570	3.9	222.7
Prince Edward Island	42	234	6,653	3.7	247.2
Totals and averages	476	3,745	5,480.8	3.76	206.2

These records are for the herds and cows under test for the full calendar year, except the months when they were dry.

The average production of the cows in Quebec is so low because a great many were milked only for short periods of seven, eight or nine months, while in the other provinces the milking periods were longer. Then, again, there were a number of herds in which the keeping of dairy records was a new thing, and these had not been graded up as the majority of the herds in Ontario and the other provinces have been.

Cow Testing Taken Over by Provinces

Since the first of May, cow testing in Saskatchewan and Manitoba has been carried on by the provincial dairy branches. The transfer of the work to provincial authority is in accordance with the announcement made to the Deputy Ministers of the Provincial Departments of Agriculture by the Dairy Commissioner at the conference held in Ottawa during March, 1920. This work is properly a provincial function and can be carried on more extensively by the provincial departments of Agriculture with their large staff of field men. The Saskatchewan Department will assume full control of the work there, while the Manitoba Department will, for the present year, only look after the field work. The Dominion Dairy Branch will continue to do the clerical work in connection with keeping the

records and pay for the testing as in the past.

From all indications, there will be another decided increase in the number of herds and cows recorded in 1921. The Quebec Department of Agriculture is continuing this year with the work which was started last spring and an increase can be counted on in that province.

In Alberta, *Agricultural Alberta,* a new farm paper published in Edmonton, has organized a production competition which will be supervised by the Dairy Promoter and will probably increase the work there.

In Saskatchewan, the Dairy Promoter accompanied the Better Farming Train through the southwestern part of the province, giving lectures and demonstrations on cow testing work; and in Manitoba, the work will be carried on and extended through the Boys' and Girls' Clubs by the Extension Service of the Provincial Department in co-operation with the dairy branch.

In Ontario, many inquiries are coming in for assistance in organizing this work and many new herds are expected from different districts. A new feature in connection with cow testing organization work is being tried in a section of milk producers. A large association has been organized by the local minister, who has had a great deal of experience in dairying, for the benefit of the members of his church. He already has over twenty farmers keeping records and a great deal should be accomplished to increase milk production in this community through the initiative of its minister.

THE TOBACCO DIVISION

BY F. CHARLAN, CHIEF OF TOBACCO DIVISION, DOMINION EXPERIMENTAL FARMS

THE improvement of native tobacco, to make it more suitable for the Canadian manufacturing industry, and bring about a more general use of the same, has been, from the beginning, one of the main objects of the Tobacco Division, one of the branches of the Dominion Experimental Farms.

The first results of these efforts were the creation of the cigar tobacco industry in the province of Quebec, and the establishment of sorting and fermenting warehouses, which have greatly contributed to the prosperity of the districts in which they are situated. The binder and filler tobaccos of the province of Quebec have now a well-established reputation.

In Ontario, tobacco growers have specialized for a number of years in the growing of White Burley, a heavy yielding variety, used chiefly in the manufacture of pipe and plug tobacco. Uniformity of the products was sought by the establishment of standard improved types, and this uniformity is now and has been for some time an accomplished fact, mainly through the work done at the Harrow Experimental Station. The seed from White Burley selections made on this station yield crops that are generally superior in weight to those coming from imported seed, and considerably earlier. The uniformity of type has also been maintained for a number of years. The result is a considerable improvement in quality. The same may be said of the growing of bright flue-cured tobacco of the Virginia type.

Increased yield, through the adoption of suitable rotations and the scientific use of manure and chemical fertilizers, is one of the main objects of the division. Anything that tends to increase the yield of the crop also tends to lower the cost, and thereby to increase the net profit to the farmer.

Methods of harvesting and curing also receive special attention. An otherwise good crop may be spoiled by the treatment it receives during harvesting and curing. Demonstrations of the most economical methods have been given, including those insuring the best and most rapid curing, and the prevention of the deterioration that is liable to occur in the curing process.

The problem of the fuel to be used in the flue-curing of Ontario-grown Virginia tobacco has become an important one, owing to the scarcity of wood in the district and the decreased supply of natural gas. A new system of heating permitting the use of coal has been installed in one of the curing houses at Harrow and will be tried this year. It is hoped that a great saving may be realized and that a fuel more easily available than wood or gas may be employed.

In order to make known more rapidly the results obtained at the Experimental Stations, and at the same time to widen the scope of the Division, a large number of experimental plots, conducted in cooperation with the growers, have been established in the growing centres of Ontario. Experiments made on such plots deal with all phases of growing and curing, and lay special stress on the scientific use of fertilizers. Thorough preparation of the soil is of great importance in tobacco growing. The advantages of fall ploughing have been demonstrated beyond question; the soil retains more moisture, a more complete use of plant food is made, and most of the insects that attack the plants in the spring, are destroyed at the beginning of the winter.

A study of the various types of beds has showed that, in all parts of Canada where tobacco is grown, a semi-hotbed under glass is the only one that gives absolutely dependable results. The canvas covered bed has been condemned and is fast disappearing.

A special study of tobacco soils in Canada has been made, and these soils have been classified according to their physical texture and compared with tobacco soils in other producing countries. The main part of this work was done in Ontario, but it will be extended to the province of Quebec as rapidly as possible.

The disinfection of seed beds to rid them of germs of diseases that might infect the crop, is also the object of special attention. Great stress was laid on the manner of disinfection with the use of steam under pressure, and the use of formaldehyde. The practice of disinfecting moulds by steam is becoming more and more common in the tobacco-growing districts of Ontario.

A very thorough study is being made of the most suitable varieties for our climate and for the requirements of the Canadian manufacturing industry. Varieties already introduced and accepted by the trade are also being improved by selection. It may be stated that the strains of White Burley and Comstock, selected by the division, are not in any way inferior to similar strains of the same variety introduced from the United States. They also have the advantage of being acclimatized in this country. The use of tobacco seed grown in Canada is recommended, not only as a means of obtaining better yields and earlier crops, but also in order to avoid such unpleasant surprises as may occur when seed of unknown purity and origin is used.

In order to secure the greatest possible uniformity in the commercial characteristics of the crop in each district, the Tobacco division has endeavoured to product a sufficient quantity of selected seed to satisfy all requests. There are few tobacco growers in Canada at the present time who have not tried the seed supplied by our experimental stations and who have not been satisfied with the results.

As regards the control of diseases, as soon as the division was able to secure seed from root-rot resistant varieties it has endeavoured to propagate the same as rapidly as possible in districts affected by the disease. A special selection of resistant varieties is also being made at the Harrow experimental station, with a view to improving the shape of the leaf and increasing the yield. Appreciable results in this direction have already been obtained.

A close study is made of the distances at which tobacco should be transplanted, in order to obtain the best results in quality as well as in yield. This is one of the most variable factors, depending on the nature and the fertility of the soil and on the conditions of the season. However, averages have already been established that are suitable in the majority of cases.

A study of the methods of control for insects injurious to tobacco fields has enabled the division to recommend the best insecticides and the best methods of application.

During the last few years the division has endeavoured to publish as complete statistics as possible of the production of tobacco in Canada. Appreciable results have already been obtained for the districts of Ontario, and it is hoped that with the co-operation of the Customs and Inland Revenue Departments, this work may be extended to the whole of Canada. It cannot be doubted that a more complete knowledge of the requirements of the Canadian industry and of the quantity of tobacco produced in Canada will tend towards the stabilization of prices, one of the most important factors in stabilizing the industry.

GOPHER CONTROL BY MEANS OF CALCIUM CYANIDE

BY G. E. SANDERS, ENTOMOLOGIST IN CHARGE INSECTICIDE INVESTIGATIONS, ENTOMOLOGICAL BRANCH

IN 1920, Mr. A. Kelsall, of the Entomological Branch, tested chlorine gas for the control of gophers at Carlyle, Saskachewan. It was found by him that gophers were very effectively controlled by injecting about one-tenth of a pound of chlorine gas, liberated from cylinders of liquid chlorine, into each gopher burrow. A brief account of this work appeared in the November issue, 1920, of the *Agricultural Gazette of Canada.*

In 1921, the writer continued these experiments and in addition tested a number of other chemicals. Among these, a comparatively new cyanide, in peculiar physical form, manufactured in electric furnaces at Niagara Falls, Ontario, showed great promise. The compound contained approximately 50 per cent calcium cyanide and is marketed in small flakes, gravish-black in colour, about $\frac{1}{32}$ of an inch in thickness and about $\frac{1}{4}$ to $\frac{1}{2}$ of an inch in diameter. It is not nearly so deliquescent as sodium or potassium cyanides. Its physical form, as well as its chemical constitution, assist in its comparatively rapid decomposition when placed in contact with damp earth, or less rapidly on exposure to air, the products being prussic acid gas and hydrated lime.

The first promising experiment with this material consisted in treating half a dozen burrows. Following this, 13 burrow openings were closed and 12 of these that were opened the next day were treated, about $1\frac{1}{2}$ ounces of the mixture finely ground being placed down each burrow. Six hours after none of the twelve treated burrows were opened although gophers had started to dig into all of them from the outside.

Examination twenty-four hours later showed that only two of the 12 treated burrows had been opened.

The next experiment, on July 11, consisted in treating an area of approximately two and one-half acres containing 62 gopher burrows. In this experiment the flake form was used. The material was carried about in an open bucket and dipped out with a long handled iron spoon and placed as far down the burrow as was possible. The spoon held approximately 2½ ounces and one spoonful was used in each burrow. A handful of weeds was placed in the entrance of the burrow and the iron spoon used to cover the weeds with earth. Placing the weeds in the entrance prevented the earth from covering the cyanide. Forty-eight hours later, not a single burrow of the 62 closed had been opened. Gophers were particularly active in the immediate area, the land being very light, sandy and dry.

The next experiment consisted in treating in the same manner as the last, 69 burrows in heavier land. Twenty-four hours after treatment, two out of the 69 treated burrows had been opened.

In another experiment a jar was measured and the amount of the calcium cyanide compound calculated to give the same concentration of gas as would obtain if 2½ ounces were placed in a burrow 40 feet long. A little earth was placed in the bottom of the jar and the cyanide thrown in on top of it. A live gopher was then introduced and the jar closed. The gopher immediately showed the effect of the cyanide; in a short time its muscles became rigid and the neck curved backwards until the head almost touched the back. The body became limp when the gopher died. Fifteen live gophers were available and all were killed in this jar. It was found that five seconds exposure to the gas was sufficient to cause death. This explained the excellent results we had obtained in the field.

We have not as yet definite data as to the cost of the cyanide treatment but it is thought that it will approximate that of strychnine poisoned grain.

The cyanide used, as above mentioned, is for the most part calcium cyanide or the lime salt of prussic acid. It must, therefore, be regarded as a dangerous poison and one which should not be stored carelessly about buildings. It should, in fact, be handled with extreme care such as are arsenic, strychnine and other poisons used in agriculture with which the public are familiar.

With strychnine-poisoned grain, there is danger in storing it in sacks in which it is always shipped, and in the field in spite of repeated instructions to put it down the burrow, the farmers almost invariably scatter it on the surface about the entrance of the burrow. thus endangering both wild and domestic animal life.

Calcium cyanide has the advantage of being as effective at one season as at another while poisoned grain is most effective for a short time only in the spring before the grasses start, so that even though it may not compete economically with poisoned grain for spring work, it should be a valuable adjunct for summer control.

PART II

Provincial Government Departments

INVESTIGATIONAL WORK AT THE ONTARIO AGRICULTURAL COLLEGE

Field Husbandry

UPWARDS of one hundred district experiments in field husbandry are being conducted on about 2,500 experimental plots at the Ontario Agricultural College. In addition to these, a considerable amount of plant breeding and certain investigational work is in progress on the eighty or more acres devoted to Field Husbandry problems, among which are the following:—

1. The use of sunflowers for silage purposes where the best varieties of corn will not grow satisfactorily in Ontario.
2. The importance of scarified or unscarified sweet clover seed when used on the farm for definite purposes.
3. The prospective value of the annual white-flowering or "Hubam" sweet clover as a farm crop.
4. The intrinsic value of the O.A.C. No. 104 variety of winter wheat.
5. Yields per acre of the Tall oat and the Orchard grass when used for pasture purposes.
6. Comparative value of different varieties of alfalfa showing the importance of Grimm and Ontario Variegated for yield and hardiness.

Bulletins or circulars on the above work have been issued.

Animal Husbandry

The following is a brief outline of the investigational work of the department of Animal Husbandry:

Horses—

The cost of maintaining farm work horses for the year.

Beef Cattle—

1. The cost of maintenance of breeding herds of Shorthorns, Herefords and Aberdeen Angus.
2. The cost of maintenance of breeding bulls—Beef and Dairy.
3. An experiment to show the value of breeding in beef production.

Dairy Cattle—

Cost of maintenance of dairy cows of the different breeds in relation to production.

Sheep—

1. Comparative weights of lambs of the various breeds.
2. Comparative wool clip of the various breeds.
3. An extensive experiment to prove or disprove the statement that it pays to fatten lambs, showing also the relative gains and profits from feeding ram lambs, ewe lambs and wether lambs.

Swine—

1. An experiment to find out the effect of feeding salt to hogs.
2. The cost of maintenance of brood sows.
3. The amount of feed required to make a pound of pork.
4. A comparison of size of litters of the following six breeds: Yorkshire, Berkshire, Tamworth, Poland China, Duroc Jersey, and Chester White.

Poultry—

1. The breeding of high laying hens and the distribution of eggs for hatching and male birds, together with the culling of breeding station flocks.

2. The accumulation of data in regard to the number of eggs laid by well managed flocks, bred similar to those at the breeding stations.

Bacteriology

1. Bacteriological analysis and plant growth tests of "Nitrobacter Soil Vaccine." This so-called "soil vaccine" is a commercial preparation recently put on the market and widely advertised.

2. Bacterial plant disease survey.

3. Continuation of the agglutination test for contagious abortion of cattle to determine its usefulness as a factor in the eradication of the disease from a herd.

4. Investigational work on bee diseases, including American foul-brood and European foul-brood.

Service Rendered to Farmers

1. Bacteriological analysis of well water samples and questionable foodstuffs.

2. Examination of poultry and farm animal specimens for presence of infectious diseases.

3. Examination of plant specimens for bacterial diseases.

4. Preparation and distribution of legume bacterial cultures.

5. Preparation and distribution of information regarding the nature and varied functions of micro-organisms on the farm and in the home.

Dairy Bacteriology

In the subdivision of dairy bacteriology a number of investigations are being conducted at the present time in co-operation with the Dairy department, of which the following are the more important:

1. Study of sanitary quality of milk delivered to the college dairy;

2. Pasteurization and neutralization of cream for butter making;

3. A study of whey-cream butter.

In co-operation with the Dairy Branch, Dominion Department of Agriculture, work is being done;

1. On yeast and mold content of creamery butter in connection with the Dominion Butter Scoring Contest;

2. A study of the sanitary handling of milk machines;

3. Investigation of new methods of bacteriological analysis.

Service Rendered to Farmers

Tests of abnormal milk to demonstrate cause, and distribution of information *re* method of control.

Investigation of any serious problem of a bacteriological nature relating to milk and its products as it arises, and as time and other work previously planned permit.

Work Recently Concluded—

"Yeasts and Molds in Pasteurized Cream Butter."

Bulletin on "Neutralization and Pasteurization of Sour Cream for Buttermaking," now in the press.

Botany

1. Potato disease investigations in co-operation with the Agricultural Representatives. Results of this work published in the report of the Minister of Agriculture, Ontario, for 1919.

2. Plot experiments with potato diseases.

3. Spraying experiments in the control of the late blight of celery. *See* O.A.C. reports for the last 5 years.

4. Experiments to test the spray method of applying concentrated formaldehyde solution for the control of oat smut. *See* O.A.C. bulletin 229 revised March 1921.

5. Investigation of the cause and means of control of winter blight or streak tomatoes. *See* O.A.C. reports 1917, 1918 and 1919.

6. Experiments in the control of Pod Spot or anthracnose of beans.

7. Experiments in the control of Rhizoctonia or Black Scurf of potatoes.

This department is at the service of farmers for the identification of weeds, weed seeds, grasses, poisonous and edible mushrooms, and is prepared to make purity tests of clover, grass and seed grain for farmers and seedsmen. The department is also prepared to give information concerning the best methods of dealing with the more troublesome weeds of the province and the prevention of diseases of cereals, vegetables, and ornamentals. Information is also available concerning the preparation and application of the more important fungicides.

Chemistry

Much time is being devoted at present to a study of soils in connection with the soil survey. As a follow-up to the survey, three demonstration plots have been established (*See* "Soil Fertility Investigation in Ontario" in this issue).

Insecticides and Fungicides—

The chief problem studied under this head was the composition of lime and sulphur wash as affected by the addition of various arsenicals, with and without the addition of hydrated lime. There is an increasing number of preparations coming on the market for the use of the orchardist and an endeavour is being made to study these materials with a view to giving information as to their value.

Wheat and Flour—

Besides doing the more or less commercial work for the millers and bakers of the province and studying the relative milling value of the various varieties of wheats grown on the experimental plots, considerable work has been done in investigating various factors in the making of bread. A bulletin on the subject has been issued.

Cattle Feeds.—The most serious matter affecting the value of mill feeds is the presence of weed seeds that are poisonous to young stock. These seeds are rich in protein and fat and make the guaranteed analysis of the feed show up well. The new Federal Government regulation will help to remove some of the difficulty that the farmers have been labouring under in the use of shorts.

Service Rendered to Farmers

1. Assistance in solving soil problems and the adaptation of fertilizers to crops and soils.

2. Advising gardeners and orchardists regarding the chemical reactions that may occur with the use of various insecticides and fungicides now on the market.

3. Examining and in some cases analyzing and reporting on cattle feeds.

4. Examining and reporting on domestic water supply.

5. Examining and reporting on the milling quality of wheat and problems in connection with flour; assisting farmers in any way possible with the whole question of human and cattle feeds.

Entomology

1. Investigation of the life history, habits and distribution of the European corn borer in Ontario and a study of control measures for the insect.

2. A study of the practical value of various spray materials and other insecticides and of the life history of various insects affecting fruit trees and control measures for same.

3. Investigation of the life history of the cabbage maggot and control measures under field conditions.

4. Direction of work in grasshopper campaigns.

The department is always at the service of the Agricultural Representatives in indentifying injurious or other insects and in advising in regard to control measures for the former.

Physics

Survey of Water Systems.—Survey of existing Water Supply, Water Systems and Sewage Disposal of the farms of Markham township, with a view to obtaining data on the difficulties being encountered and needs felt by the farmers, so far as water systems on the farm are concerned.

Tractor vs. Horse-power on the farm.—Tractor versus Horse-power on the Ontario farm has formed the basis of a survey of the province, and the following conclusions have been drawn from data secured:

A tractor in the hands of an expert pays on an average farm of over 100 acres. In the hands of any one but an expert, it does not pay under any conditions. A saving of about $120 per year is effected by substituting a tractor for horses and about 15 per cent more land is cultivated.

Life of a tractor is approximately 10 years.

Practically all tractors used are of the 4-wheel type and 12-24 horse-power.

Two and a half horses are replaced by a 12-24-horsepower tractor.

Reduction in the number of horses replaced is not so large as might be expected, practically no horses having been disposed of except those kept for use at a time of peak load on the farm in the spring.

Mansfield Water Finder.—The Mansfield Finder has been tested and found wanting under Ontario conditions. Ontario is badly in need of a survey of geological conditions to determine the "possibility" of finding water in many places where useless drilling is being done. Practically no information is available except through the medium of data in the hands of local well drillers and these seldom keep logs of the wells drilled.

Lightning Rods and Rodding System.—Practically any pure copper rods on the market to-day are recommended if over 3 ounces per foot in weight. Rods of two metals are not recommended.

Rodding methods are improving rapidly due to educational work being carried on by the rodding companies themselves, by lectures from the members of the staff, and by co-operation with the office of the Fire Marshall for Ontario in inspecting and criticizing systems throughout the province.

Drainage Tile.—Concrete and clay tile from all parts of the province have in the past year been thoroughly tested for strength and absorptive power and they are found to be lacking somewhat in the latter respect.

Concrete tile are being used to a slight extent, but only in cases where either the farmer has no knowledge of the weak points of this sort of tile or where a reputable firm have established a reputation for good workmanship in their product. The majority of farmers are hesitating pending further investigation of the merits of the concrete tile.

There is as we see it nothing to fear under ordinary conditions in using concrete tile, but one is well advised to test the product before buying in large quantities, as improper curing of tile of this sort is resulting in many cases in a product unfit for use for drainage purposes.

Insulating Materials.—Relative Values of Insulating Materials were worked out, particulars of which are available.

Tests of Flax Chaff and Wood Wool are now being carried on and will be reported upon at an early date.

Farm Economics

Farm Economics is a comparatively new department, and, as farming is conducted in Canada, an exceeding important branch. For popular understanding, it may be defined as the business of farming, and thus distinct from the technique of farm practice details. It recognizes the fact that a farmer may be an expert tiller of the soil, an ex-

pert herdsman, an expert fruit grower, and yet not succeed in proportion as his expertness deserves, because of defective general management. His capital investment may be too great for his volume of business and he does not receive a proper interest income. His costs of production may be too high, and he has no margin of profit to reward him for his labours. He may be a poor salesman or he may be producing commodities not suited to his immediate markets. He may also be trying as too many Canadian farmers still try to do, to plough a lone furrow, to maintain his individualism in his business, and ignore the business opportunities offered by the co-operative society.

Farm Economics or Farm Management seeks to correct all this by investigating the financial condition of the farming business, costs of production, income in relation to capital investment, maintenance and working costs, available labour and its distribution and the most profitable selection of crops and other farm products in relation to available markets. Farm Management takes into account the layout of crops in rotation, the outlay of labour for most effective results, the outlay of cash for economical maintenance including breeding stock, fertilizers and feeds, the proper point of intensity of operation, the most profitable degree of specialization in the main products of a locality, and the most economical and effective mode of marketing the produce.

Service Rendered to Farmers.—The Department of Farm Economics renders service to farmers in three different ways:

1. In devising and presenting elementary systems of bookkeeping that are suitable for the average farmer's needs.

2. In presenting, through bulletins, reports and on the platform the information regarding farm business that is discovered in the surveys or investigations conducted on 1,500 Ontario farms, representing all types of farming found in the province. In the districts actually surveyed, each farmer from whom information is obtained is supplied with an itemized analysis of his own farm business to enable him to make such changes or improvements as may be suggested from such accurate knowledge of his own farm business and that of his neighbours.

3. In presenting to boards, commissions and price-arranging bodies accurate data on production of farm products on which more fair and equitable prices and conditions may be evolved than if this information were lacking. Much has already been accomplished along this line in relation to milk prices and freight rates on live stock.

SOIL FERTILITY INVESTIGATION IN ONTARIO

BY R. S. HARCOURT, PROFESSOR OF CHEMISTRY, ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONTARIO

THE soil fertility investigations conducted by the Department of Chemistry of the Ontario Agricultural College may be divided under three headings:—

I. Soil Survey;
II. Laboratory and Pot Culture work;
III. Field Experimental Work.

A preliminary soil survey has been made of the greater part of Western Ontario and a portion of Eastern Ontario lying between Ottawa and Morrisburg. This phase of the work was started by the late Professor A. J. Galbraith and continued by the late Mr. W. L. Iveson. The loss of these young and most capable workers in agricul-

tural science has been greatly felt. Since the death of Mr. Iveson in February, 1920, the soil survey has been held in abeyance pending the appointment of a successor.

Considerable laboratory and pot culture work has been done in connection with the soil survey, but here again progress has been held up for the past year owing to shortage of staff.

In connection with the field experimental work, three experimental grounds have now been established, one at the Ontario Agricultural College on loam soil, a second on fine sand soil near Simcoe, Norfolk county, and a third on heavy clay soil near Welland, Welland county.

The scheme of experiments on the field at the College consists mainly of fertilizer tests to ascertain the relative productive value of the various fertilizers supplying nitrogen, phosphorus and potassium respectively. The results obtained from these experiments are proving invaluable in answering the increasing number of inquiries from farmers, and especially in relation to the use of new fertilizers. Among other things these plots have clearly demonstrated that for mangels, nitrate of soda is very much superior to any other form of nitrogen we can supply and that the calcium cyanide applied as the only source of nitrogen is very much inferior to all our other common sources of this constituent. Our co-operative work throughout the country clearly indicates that the main mineral deficiency of our soils is lime and phosphorus. I am convinced that if we have plenty of organic matter in the soil and use a fair amount of stable manure that for most of the crops lime and phosphorus are the only fertilizer constituents that will give paying returns.

The Simcoe experimental field was started in the fall of 1919, and next year will bring all the ranges of the rotation under complete experiment. Analyses of the sand soil of this field, which is typical of the main area of Norfolk county, show the main deficiencies to be organic matter, phosphorus and lime. By the system of cropping and fertilizing adopted, it is hoped to demonstrate a method whereby the Norfolk sand may be built up in these three ingredients and at the same time produce profitable crop returns. During the first season of 1920, encouraging progress was made in the results obtained, and an annual report of the work being done at Simcoe will be available shortly.

The field at Welland was taken over in September, 1920, and a large amount of work has been done in cleaning up the land, erecting a barn and planning out the ground in detail. Fifteen acres of the field have been tile drained and five acres left undrained as a demonstration of the necessity for drainage on this heavy type of soil. A rotation suitable to dairy farming, which is widely pursued in the county, is being followed, namely: 1, Wheat (seeded); 2, Hay; 3, Corn; 4, Oats (½ seeded); 5, (*a*) Hay followed by wheat, (*b*) Fallow followed by wheat. One range of experiments is being devoted to tests comparing the relative merits of ground limestone and hydrated lime in varying quantities. One of the main features in the fertilizer tests to be carried on throughout the rotation will be the determination of the most suitable form of phosphorus fertilizer for application on the Welland clay. The experiments with wheat will be seeded this fall, and the whole field will come under the rotation in 1922.

Mr. A. L. Gibson has been in charge of the work of establishing these experimental fields up to the present time, but is about to take up the position of Dairy Chemist at the College, and will be succeeded in the soil fertility work by Mr. S. Waterman, recently appointed to the Department of Chemistry.

THE ORDER OF AGRICULTURAL MERIT FOR THE PROVINCE OF QUEBEC

BY A. LETOURNEAU, DIRECTOR OF THE JOURNAL OF AGRICULTURE

THE Order of Agricultural Merit is an official institution of distinction, established in 1890 for the purpose of encouraging and honouring agriculture in the province of Quebec.

It includes four classes, viz:—

(*a*) The graduates "diplômés" who have received a diploma;

(*b*) The winners "laureates" of the bronze medal;

(*c*) The winners "laureates" of the silver medal;

(*d*) The winners "laureates" of the gold medal.

These marks of distinction are granted at an annual competition, which takes place alternatively in the five districts forming the complete cycle.

The Minister of Agriculture of the province is ex-officio, Laureate of exceptionally distinguished merit of the Order. There can be only one Laureate of the gold medal at each annual competition.

History of the Order

Great enthusiasm was shown during the first five years from 1890 to 1895, and many competitors entered. The actual number was 371. In the second cycle, 271 competitors were recorded. There were 222 in the third cycle, 175 in the fourth and only 152 in the fifth.

In the fifth division there were 32 competitors in 1914, compared with 82 at the first competition. In 1915 there were 9 competitors in the first division compared with 34 at the beginning.

The twenty-fifth anniversary of the foundation of the Order was celebrated in 1915, which was the year of Agricultural Progress at the Quebec Provincial Fair. Great and impressive demonstrations took place on September 1, 1915, in the presence of the highest official and civil personalities of the province, and more than 400 surviving laureates. On this occasion a high mast was erected by the laureates themselves, to commemorate the celebration of this anniversary.

Progress

In 1915 the Honourable Mr. Caron, Minister of Agriculture, said with remarkable foresight:—

"This celebration opens a new era in our annals. It marks an important step in the development of our agriculture. It brings out in a striking manner the high merit of the laureates and shows them as an example to be followed by the whole population. The good effect of this splendid celebration is shown in the agricultural awakening which is taking place in this province. I hope this fine movement will continue, and I trust that the Order of Agricultural Merit will receive new knights of agriculture each year in ever increasing numbers."

This expectation has been magnificently fulfilled. The competitions of 1916-1917, 1918, 1919 and 1920 have testified to a revival of agriculture. During this period 361 competitors have been proclaimed Laureates, as compared with 153 during the previous cycle.

The Quebec Provincial Fair has had its share in this remarkable progress. Through its annual demonstrations in honour of old laureates and of new ones, it has created great rivalry among the agricultural class, and has made known the importance of the work of the farmer.

In 1916 an official flag of the order was inaugurated by the management of the fair, and a special and solemn song was consecrated, *"O Laboureur, artisan des sillons!"*

In 1917 a member of the Catholic clergy, Reverend Louis F. Côté, of St. Alexis de Matapedia, was among the most distinguished competitors.

In 1918 the name of a minister of the Crown, the Honourable J. A. Tessier, the present Minister of Highways, appeared on the list of competitors for the silver medal. In the same year, among the competitors for the silver medal were the names of two worthy Canadian women, Madame Jos. Lamy, of Yamachiche, St. Maurice county, and Madame Eugène Bernier, of St. Stanislas, Champlain county. And since 1915, the celebrations at the Provincial Fair of Quebec have been notable for distinction and significance.

Competition of 1920

The inspection of the 49 farms entered in the competition of 1920 was undertaken by Messrs. Thomas Drysdale, Jos. Deland, Arsène Denis, who have been judges of Agricultural Merit, since 1897. The secretary of the judges is Mr. J. A. Marsan, who has been in charge of this work since 1900. Men of no greater learning or experience could be found. No one could deny the efficiency of this jury, and their decisions, based on the strictest impartiality, has never been protested.

All the competitors in the contest of 1920 were distributed in the counties of the first division of the sixth cycle. They were as follows:—

Argenteuil, 5; Beauharnois, 4; Châteauguay, 4; Deux-Montagnes, 16; Hochelaga, 1; Huntingdon, 3; Jacques-Cartier, 2; Laprairie, 2; Laval, 2; Napierreville, 3; Soulanges, 1; Terrebonne, 1; Vaudreuil, 4; total, 49.

The judges who decide on the merits of the competitors are appointed by the minister and chosen among the laureates, who have received the degree of distinguished merit or of exceptionally distinguished merit, or among the professors of agricultural colleges.

The judges ascertain, first, those who get the most from their land without exhausting the same and with the least expenditure, in comparison with the net returns. Merit, work, and not wealth, are rewarded.

A diploma and a silver medal are granted to those who receive the degree of *very high merit*. At least 85 marks out of 100 marks are allowed for perfection. A diploma and a bronze medal are granted for the degree of *great merit*—that is at least 75 marks out of 100. A diploma for the degree of *merit* —that is at least 65 marks out of 100.

For the purposes of this contest, the province is divided into five agricultural districts, and the competition is held each year, beginning by district No. 1 and finishing by district No. 5.

The first district includes the following counties: Argenteuil, Beauharnois, Châteauguay, Deux-Montagnes, Hochelaga, Huntingdon, Jacques-Cartier, Laprairie, Laval, Napierville, Soulanges, Terrebonne and Vaudreuil.

The second district includes the counties of Bagot, Brome, Chambly, Compton, Drummond, Iberville, Missisquoi, Richelieu, Richmond, Rouville, Shefford, Sherbrooke, Stanstead, St. Hyacinthe, St. Jean, Verchères and Yamaska.

The third district includes the counties of Arthabaska, Beauce, Bellechasse, Bonaventure, Dorchester, Frontenac, Gaspé, Iles-de-la-Madeleine, Kamouraska, Lévis, l'Islet, Lotbinière, Matane, Mégantic, Montmagny, Nicolet, Rimouski, Témiscouata, Wolfe.

The fourth district includes the counties of Berthier, Champlain, Joliette, Labelle, L'Assomption, Maskinongé, Montcalm, Pontiac, St. Maurice, Trois-Rivières, and Wright.

The fifth district includes the counties of Charlevoix, Chicoutimi, Lac St. Jean, Montmorency, Portneuf, Quebec, and Saguenay.

Competitors

All those who have observed the conditions specified in the Act and by Regulations in Council are eligible.

In each case the competitor must work, either as owner, farmer or lessee, a farm of which at least fifty acres are under cultivation, either in field crops, pasture, garden, vegetables, orchard, small fruits, etc.

Entries must be made before May 1 of each year by the competitors, on forms sent out by the Department of Agriculture. The form contains a number of questions for the information of the judges, which competitors are requested to answer. Entries must be forwarded to the Secretary of the Agriculture Council on or before June 1, and no entry can be accepted after that date.

The decision of the judges must be based upon the merit of the system of farming, no matter what may be the quality of the soil or the kind of crops grown, or the system of improvement. They must find out to what extent the competitor may have served as an example to the community by the way in which he works his farm.

In judging buildings, the judges must begin with the farm residence, its situation, drainage, ventilation, water supply, etc. Not only the barns, stables, pig sties, sheep folds, etc., must be carefully inspected, but special attention must also be given to the dairy, ice house, poultry house, etc. In this examination, as well as in the examination of agricultural implements and tools, judges must take special notice of any improvement or innovation, and give a description of the same in their report. They may, at their discretion, grant a certain number of marks, in proportion to the importance of such improvements, which marks are taken from the rest of the marks yet to be granted.

In scoring, the judges must take into consideration not only the field crops and the major operations but also all minor industries such as cheese and butter-making, poultry, bees, and domestic products, and consider if these special lines are adapted to the conditions in which the competitor is placed and are of such a nature as to give him a profit.

The judges must make sure that everything they are called upon to inspect, such as land, cattle, and farm implements, really belongs to the farm, and forms part of its stock and equipment.

When judges notice gross neglect on the part of a competitor as regards the destruction of weeds, not only must they not allow any of the marks provided for that item, but they must deduct a certain number of marks, not exceeding five, from the total allowed on other subjects, and make special mention of the same in their report.

The competitor must show what improvements he has made, especially during the previous year. He must give specific information as to his rotations, the care he gives to the selection of seed, the manner in which he cares for his meadows, the fertilizers applied, the arrangements he had made, keeping and utilizing manure, the depth of ploughing, his drainage system, his manner of managing pig sties in winter as well as in summer, his manner of feeding his pigs, cows, sheep, and other live stock.

Competitors are requested to include with this information a small plan of the land which they desire to enter, showing the divisions, the size of each division, the location of the buildings, streams, ditches, etc. It is not expected that this plan should be as exact as a surveyor's plan; all that is required is a sketch such as any intelligent farmer could make or have made by his family or with the help of his neighbours.

EXTENSION WORK OF THE COLLEGE OF AGRICULTURE, UNIVERSITY OF BRITISH COLUMBIA

General Progress

FOR the first time in the past three years the College of Agriculture of the University of British Columbia has opened with a full staff in all departments. Recent progress also includes the completion of the organization of the extension service. At the University Farm, Point Grey, a further area of land has been cleared. An additional one hundred acres were cut over and burned under the relief scheme last winter. A small but serviceable agronomy barn for storage purposes has been made ready for use, and a general extension has been made in all branches of the work. Through the courtesy of the provincial government, seven Clydesdale mares, Nerissa, Peggy Pride, Opal, Colony Opal, Melita Dunure, Colony Baroness and Lady Begg, have been transferred from Colony Farm, Essondale, to the University Farm for instructional purposes. Four foals by Baron's Best were added to the group this year. The college may now be considered to have reached a certain degree of maturity in that the first graduates —eight in number—received in May this year the degree of Bachelor of Science in Agriculture.

Organization of Extension Work

The extension work of the College of Agriculture may be divided into two divisions: (1) Extension teaching; (2) Extension investigation.

(1) The Extension teaching is in the nature of Extension Schools of not less than four days' duration offered in such sections of the province as apply for them. The work offered is planned to meet the requirements of the district, and an attempt is made to deal with basic principles that are broadly educational rather than to offer work in the nature of practise schools, such as box packing, pruning, or similar problems. (This latter is in the hands of the Department of Agriculture, and is performed through the District Representatives). In addition, field meetings may be held to discuss results of experiments conducted by the extension division.

(2) The Extension investigation is organized by projects and comprises:

(*a*) An economic study of the Dairy Industry including farm incomes, and a study of the factors influencing farm incomes and cost of production on the farms included in the survey.

(*b*) An economic study of the Tree Fruit industry including the problems indicated above for dairying, but in addition a study of variety yields at different ages as a basis to a study of the variety problem.

(*c*) An economic study of the Poultry Industry along the lines indicated for Dairying.

(*d*) A bacteriological study of the factors influencing the grade and quality of milk, cream, butter and cheese. This work is being carried from farm to creamery or dairy or city milk depot.

(*e*) (1) An experimental study of the effect of various fertilizers on farm crops under the varied conditions in the province.

(2) An experimental study of various grass mixtures for hay and pasture purposes. These tests are being carried out on farms which are widely scattered throughout the province.

FIELD HUSBANDRY EXPERIMENTS IN RELATION TO FARMING

BY MANLEY CHAMPLIN, PROFESSOR OF FIELD HUSBANDRY, COLLEGE OF AGRICULTURE, UNIVERSITY OF SASKATCHEWAN

FIELD Husbandry Experiments have a very direct relationship with practical farming whether the farming be grain growing, stock growing or both combined. The grain grower requires the best seed obtainable of the best varieties of wheat, oats, barley and rye. We endeavour to determine which are the best varieties and then to breed better ones and put the seed out to people who will increase it and make it available for all. The stock grower requires feed. We endeavour to serve him by determining the best kinds of forage crops and the best methods of producing them. The grower of both grain and livestock is interested in both these phases of experimental work and also in crop rotation and soil fertility. The potato and truck grower is anxious to secure the best standard varieties and to learn how to grow them to the best advantage. Our field husbandry experiments at Saskatoon are designed to serve all these classes of farms, the grain farm, the livestock farm, the diversified farm and the truck farm. If we may liken the work of the field husbandry department to the structure of a building, we would consider the experimental work as the foundation, the class room teaching as the building itself and the extension work, including correspondence and outside teaching as the towers, porches and cupolas. In short, the experimental work is the basis upon which rests all of the other activities of the department.

Division of Experimental Work

There are four fundamental problems that confront every farmer, which come within the confines of this department. The first is the question as to what is the best variety of wheat, of oats, of barley and of other crops and whether there isn't something better than we have at present. To help in solving this problem we have plant breeding projects with each of the important cereals and with sweet clover and alfalfa, as well as almost innumerable variety and strain tests to determine what is best among the varieties already developed.

The second question relates to the rotation of crops. There is little question but that God intended crops to co-operate. He provided some with numerous small fibrous roots and others with long branching tap roots. He ordained that some crops may be sown broadcast and that others must be sown in rows and cultivated. The very nature of these crops indicates that they were intended to help each other. It is the purpose of our crop rotation experiments to find out the various means by which the crops can be rotated so as to co-operate and thus help one another.

The third question has to do with the production of feed or forage crops. Our experimental work in forage crops is designed not only with a view to finding out what kinds of grasses, corn, sunflowers, roots, and clovers are adapted to our use but also to learn the best methods of planting and growing the crops. There is almost an untrodden field ahead of us in this direction.

The fourth great fundamental problem relates to farm management with a view to maintaining soil fertility. At first thought we might consider this problem as absolutely hopeless. When we consider that every freight train that leaves the province loaded with grain carries with it the vital plant foods, nitrates, phosphates, potash, etc., we might conclude that our case is hopeless. But when we consider the great soil improving qualities of certain

plants such as clover and alfalfa and the magnificent prospects of the live-stock and dairying industry, which manufactures its own fertilizers, we become more hopeful. Our experiments started this year in co-operation with the newly established soils department are designed to determine ways and means by which the soil may be maintained in something like its original state of fertility.

The problems of tillage have been pretty well worked out. Since the days of Jethro Tull, experiments relating to tillage and cultivation have given much the same conclusions. We know that we must plough thoroughly and vary the depth somewhat according to the crop to be grown. We know that for cereals and grasses, the seed bed must be firm. We know that cultivation should be sufficient to keep down the weeds, and that the object of our surface tillage must be to keep the soil receptive to moisture. These facts are well established. For that reason, we are not carrying on any tillage experiments at the present time. Something had to be left out, and it seemed to us that the tillage questions were nearest to solution of any. Thus briefly, our field husbandry experimental work includes: plant breeding, variety testing, crop rotation, methods of growing the crop, both cereals, forage and truck, and methods of maintaining soil fertility.

Products of an Experiment Station

The products of an experiment station consist of two things: The first is record of results. The second is seeds. Every care is used in maintaining the accuracy of the records and the purity of the seeds. Special bookkeeping methods are devised and used for the purpose of recording the results. Since there are now 5,000 separate and distinct items, it will be readily understood that this is no small task. We are constantly endeavouring to improve our system of record keeping to make it more effective and complete.

The seeds which we distribute are not only rigidly fanned and cleaned but are hand picked if need be to take out any impurity that the fanning mill fails to remove. Every lot of cereal seed sent out during the past season had been hand picked. On account of the large number of strains and varieties which we are growing, the greatest care is required to keep seeds pure. In short, it is almost impossible to do so. But we put these seeds out under a rigid guarantee that they must be satisfactory or that they may be returned and the purchase price will be refunded. This year not a seed came back. This record speaks volumes for the faithfulness and care of the men who did the work.

A Survey of the Experimental Plots

The experimental field is surveyed into 15 strips or series each eight rods in width. These are separated by roads 20 feet wide. The series are subdivided into blocks containing about 1.2 acres with 20 foot roads separating them. This gives a total of 110 blocks of a little over one acre each. Entering the main gate will be found, to the right, alfalfa introductions from all parts of the world. On the left is seen the alfalfa breeding work where hundreds of plant progeny are being tested. Proceeding southward, the blocks growing special selections of wheat and yellow sweet clover are observed. As we go on through we find variety tests with corn, tests of various mixtures for hay, sunflower, and potato experiments, ten blocks devoted to soil fertility tests with most of the important crops and winter rye tests over to the right. Soon we come to the pure seed production fields of Grimm alfalfa and brome grass. Nearby we find the grain breeding and testing plots and as we circle back to the north we see the elaborate set of crop rotation trials wherein over a hundred different crop rotation schemes are in progress. This

brief survey will indicate how the work is done, how the tests are made, and all will agree that each of these 5,000 experimental units has a direct bearing upon the success of agriculture in this province.

POULTRY HUSBANDRY DEPARTMENT OF MACDONALD COLLEGE

BY M. A. JULL, PROFESSOR OF POULTRY HUSBANDRY

THE primary function of the Poultry Husbandry Department of Macdonald College is teaching. Since teaching divorced from experimental and research work is barren, therefore the department aims to carry on a few lines of experimental work. Since teaching is impossible without students, some kind of extension work becomes necessary; therefore the department endeavours to keep in touch with the young men of the country districts through various lines of extension work. Since all these lines of work necessitate the keeping of a fairly large number of birds on the plant, a certain amount of commercial work naturally follows. Briefly then, the department is conducting four lines of work, namely — Instructional—Experimental—Extension—and Commercial.

Instructional Work

The teaching of Poultry Husbandry at Macdonald College involves a four year course of instruction to B.S.A. students, a practical course of instruction to the Winter Course students and instruction in a Poultry Short Course. The first and last courses are practically the same as given at other institutions. In regard to the instruction given to the winter course, however, a plan different from usual is followed. The boys enter the course about the first of November and all of the poultry instruction given in the first term is concentrated in the first three weeks after their arrival. This enables the Poultry department to provide for practical work in the production and preparation of poultry products for market, undertaken by the students in conjunction with the lecture courses. The same plan is followed in the second term in which case all the poultry lectures are given in the last five weeks of the term, from the early part of February to the middle of March, and the students are given practical work in incubation and brooding.

Experimental Work

The breeding work, involving the development of laying strains of Barred Plymouth Rocks, S. C. Rhode Island Reds, White Wyandottes and White Leghorns has been continued. Detailed records were continued regarding fertility, hatchability, livability, and progeny production. A large number of pedigree breeders were distributed, and as the work progresses there should be available for farmers, larger and larger numbers of high class male breeders from heavy laying strains. Continued and wider distribution of such breeders should do much toward improving egg production on the farms.

Yearly records were continued on determining the amount and cost of feed to produce one dozen eggs in Plymouth Rock and Rhode Island Red pullets and yearlings. The continuation of this work for two or three more years will provide us with considerable information of value to the farming community.

Experimental work in the fattening of roasters was continued, the chief factors under consideration being the determination of the optimum weight for fattening; the relative rates of increase in flesh production in a ten-day, two-week

and three-week feeding period; the efficiency of various fattening rations, with special reference to the use of beef scrap as a substitute for skimmilk; dressing percentages of roasters. It was found that the optimum weight for fattening was about 3.5 pounds with Barred Plymouth Rocks and Rhode Island Reds. With large birds the ten-day period was found most profitable, but with birds weighing about 3.5 pounds each, the two-week period was the most profitable; although it should be pointed out that where the farmers can get top prices for well-finished roasters, the three-week period is advisable, because of the superior finish, in spite of the higher cost of production. A ration containing ten per cent beef scraps was found most profitable for 3.5 pound birds on a two-week feeding period, the average gain in live weight being 1.101 pounds per bird. The average number of pounds of ration required to produce one pound gain in live weight was 7.318 pounds. The average percentage of the ration retained as gain in live weight was 14.411 per cent. The average dressing percentage to the live fattened weight was 89.354 per cent and to the initial live weight 120.867 per cent.

An experiment was conducted to determine the edible portion of roasters, the drawn weight was found to be 80 per cent of the live fattened weight and 82 per cent of the dressed weight. The edible portion was found to be 61 per cent of the live fattened weight, 67 per cent of the dressed weight, and 77 per cent of the drawn weight. The cooked body flesh was found to be 35 per cent of the live fattened weight, 39 per cent of the dressed weight, 49 per cent of the drawn weight, and 66 per cent of the cooked drawn weight.

The experiment in determining the amount of food required to produce one pound of flesh in raising Pekin ducks was continued, as was also the experiment in determining the rate of growth during the first eight weeks. As compared with previous years when an average of 3.073 pounds of food were required to produce one pound of duck flesh, last year, 4.406 pounds of food were required. The results of previous experiments gave an average weekly weight per duck, for the first eight weeks of .103, .166, .353, .519, .876, 1.564, 2.153, 2.851, and 3.712 pounds while the results last year were: .132, .143, .227, .311, .606, 1.030, 1.626, 2.180, and 2.591 pounds.

During the past year work was conducted on the following problems: egg weight as a criterion of production, seasonal variation in the weight of eggs, seasonal variation in weight of yolk and albumen in relation to the total weight of egg, inheritance of weight in eggs, proportion of sexes hatched in relation to egg production, proportion of sexes in crossing work, proportion of sexes at various seasons of the year, rate of growth in male and female Barred Plymouth Rock chicks.

Extension Work

The extension work involves much that is common to other institutions and involves the distribution of literature, the giving of lectures and demonstrations at farmer's meetings, the judging of poultry at agricultural fairs and poultry shows, and assisting local poultry associations in various ways. The most important lines of extension work involve demonstrations in culling the laying flock and in fattening and killing poultry for market. These are two important lines of extension work which will demonstrate to the farmer the possibility of making his flock much more profitable.

Commercial Work

Between 1,200 and 1,500 layers are kept annually, the great majority of these being bred-to-lay birds. It is not possible to operate the poultry plant on a strictly commercial basis inasmuch as considerable expense is involved in

providing teaching material and giving demonstrations. Experimental work also interferes with operating the plant from a strictly commercial standpoint. Nevertheless we are able to make a satisfactory showing and the experience gained enables us to give much more effective instruction in poultry economics. Results so far have shown that it is quite probable that the most efficient ways of developing the farm poultry industry constitute the purchase of incubators and brooders on the part of the average farmer, otherwise it is highly probable that the near future will see government hatcheries and brooderies established and farmers purchasing partially developed bred-to-lay pullets obtained from eggs supplied by officially controlled breeding plants.

BETTER SIRES FOR SASKATCHEWAN HERDS

Progress of the Campaign against the Scrub Bull

BY J. H. ROSS, SASKATCHEWAN LIVE STOCK BRANCH

THE first organized effort for live stock improvement in Saskatchewan was started in 1909 by the organization of the Saskatchewan Cattle Breeders' Association. This association of the prominent stockmen of the province has done very effective work by encouraging the breeding of better live stock and the holding of annual sales of pure bred stock. Through the co-operation of the association and the Live Stock Branch, annual sales are held at Regina, Prince Albert and Saskatoon. During 1921 approximately five hundred and fifty head of pure bred stock were offered for sale. A large percentage of these pure bred sires went to herds formerly headed by scrub sires.

In order to assist farmers who were not in a position to purchase pure bred sires, the Department of Agriculture in 1913 passed *The Live Stock Purchase and Sale Act,* whereby bona fide Saskatchewan farmers can purchase pure bred sires on one-half or one-quarter cash basis, the balance payable in two notes, the first due at the end of the current year, and the second due the end of the next succeeding year; interest at 6 per cent. To date, over 1,000 pure bred sires have been supplied, which means the elimination of at least an equal number of scrub sires. The Act referred to was the medium through which many prominent breeders obtained their first pure bred sire.

During the present year it was realized that a more concentrated effort should be devoted to the improvement of the live stock in the province by an endeavour to eliminate the scrub sire. This "Better Bull Campaign" was carried on through the co-operation of the Saskatchewan Cattle Breeders' Association, the Live Stock Branch and the Dominion Department of Agriculture. It was felt that the time was not ripe to pass laws prohibiting the use of scrub sires, and it was therefore decided to conduct the campaign along educational lines, and demonstrate the importance of having a good pure bred sire in every herd.

The programme for 1921 was carried out by getting the names of as many owners of scrub bulls as possible and placing their names on our mailing list; obtaining a list of a large number of breeders having pure bred bulls for sale, and mailing a circular giving particulars regarding breed, name and number of bull; age, weight, colour, and price, to owners of scrub bulls, secretaries of rural municipalities, etc. With the aid of the information given in this circular, farmers were enabled to exchange aged

bulls or purchase young bulls direct from the breeder.

Monthly bank bulletins were also published, showing the advantage of using a pure-bred sire, and announcing important live stock events such as the Association bull sales. A number of circulars were printed, showing the necessity of using better sires, and stating how same could be purchased on easy terms through the Saskatchewan Department of Agriculture or loaned to farmers' clubs by the Dominion Department of Agriculture. This literature was distributed to all banks in the province, secretaries of rural municipalities, members of the Cattle Breeders' Association, and owners of scrub bulls.

Through the co-operation of the Department of Agriculture and the Canadian Pacific Railway Company, a "Better Bull Special" was run in conjunction with the Dairy and Field Crops cars in the southeastern part of the province. This train carried representative sires of all the leading breeds, as Shorthorn, Hereford, Angus, Holstein and Ayrshire. These bulls were sold for cash or on credit terms, or exchanged with farmers for pure bred sires. Scrub sires were purchased at market prices, and the amount credited as cash payment on pure bred sires purchased in exchange. Considering the unfavourable live stock market situation, and the inferior crops obtained for several years in the southeastern part of the province, the enterprise may be looked upon as a decided success. Twenty-one different towns were visited, and twenty-four meetings held, with an attendance of approximately five thousand people. At each meeting the live stock representative in charge gave an address regarding types and breeds of farm animals, and the necessity for using better sires. In all, twenty-one pure bred bulls were placed, five pure bred bulls were exchanged, and several scrubs were purchased and replaced with pure breds.

This year an exhibit of pure bred bulls and butcher steers was sent to all the larger fairs in the province. The car of pure bred sires had representatives of all the leading breeds. They were sold to farmers for cash or on credit terms. Quite a number were sold on the circuit. The car of butcher steers consisted of twelve head, classified as export, butcher, feeder and common steers. Each group had a representative of Shorthorn, Hereford and Angus breeding. These steers were purchased at the Winnipeg Stock Yards. The export steers averaged 1,363 pounds and cost $117.45 per head; the butcher steers averaged 1,200 pounds and cost $94.05; the feeders averaged 956 pounds and cost $52.95; while the common steers weighed 574 pounds and cost $18.97. This exhibit was an object lesson to farmers, showing the advantage gained by using good, pure bred sires. The export and butcher steers showed good breeding, and were the kind that always pay their way, while the common steers showed mixed breeding, were under size, of poor conformation—the kind that are fed at a loss.

A motion picture film is being produced in connection with the campaign. This film will show the results obtained by farmers in Saskatchewan from crossing the ordinary grade females with pure bred sires of the leading beef and dairy breeds. This film will be used in connection with short course work during the winter months.

Work in connection with the campaign was considerably handicapped during the present season by the extremely heavy drop in the price of butcher cattle. Notwithstanding the various handicaps our work was quite successful, and we hope that by united effort we can extend considerably the work of the "Better Bull Campaign" next year.

ALBERTA POTATO GROWERS ORGANIZE

BY J. H. HARE, POULTRY COMMISSIONER

THE commercial potato growers of central Alberta in co-operation with the provincial department of Agriculture have recently undertaken a reorganization of the potato industry. A beginning has been made in the Edmonton district where the Edmonton Potato Growers' Co-operative Association has been formed. It has been apparent for some time that the potato business in Alberta has suffered from a lack of organization and the application of proper methods in marketing. In the spring of 1920 action was taken by the Department of Agriculture and the more progressive growers which resulted in the formation of a general improvement association called the Edmonton District Potato Growers' Association. While this association was not equipped to market the crop co-operatively a considerable amount of good was done, through it, in standardizing methods, in extending the practice of grading, in limiting the varieties grown and in spreading information as to better methods of culture and disease control. In this educational work the Field Husbandry Department of the Alberta University co-operated and rendered invaluable service to the growers.

At the conclusion of these early efforts it was felt that something should be done to organize the marketing. It was agreed that the problem of greatest urgency was the problem of marketing and that if the conditions warranted, a co-operative marketing association should be formed. With this in mind the growers approached the Department of Agriculture and asked for assistance. In response the Minister of Agriculture commissioned an officer of the department to secure the necessary information for the guidance of the growers and to make a personal investigation of the potato marketing organizations in the states of Michigan and Minnesota. This was done in the month of June, 1921. In July a report was made to the growers and on a basis of this report and accompanying recommendations the Edmonton Potato Growers, Limited, was formed.

This association is purely co-operative in form and is patterned after the more successful types of co-operative associations in Canada and the United States. The objects of the association are to encourage better and more economical methods of production and to secure better results in grading, packing, advertising, and marketing the potato crop. The shares of the association have a par value of $25. The association takes the share form of organization in order to conform to the requirements of the Alberta Co-operative Societies Act under which it is incorporated.

The membership is limited to producers of potatoes living in the territory tributary to the business office of the association. A grower on becoming a member is required to purchase at least one, but not more than ten shares, paying in cash 20 per cent of the par value. He must also sign a negotiable non-interest-bearing demand note for two hundred dollars ($200) which is made out to the order of the association. These notes are used as collateral security with which to borrow funds in financing the various operations in connection with the marketing of the crop. It is a simple yet effective system of financing and means, simply, that each member loans the association two hundred dollars of his credit. With the membership at 47, where it stood on September 20, the association had established a credit with the bank on the strength of these notes alone of $9,400. The notes are the property of the association and are available in the settlement of any liquidation damages which may result from

the failure of any member to live up to his contract with the association.

The Crop Contract

In addition to the above the incoming member is required to enter into a contract with the association respecting the handling and marketing of his crop. This contract specifies, among other things, that the grower appoints the association his agent for the purpose of handling and marketing his potatoes, and he binds himself to deliver to the association his entire crop. The period of the contract extends indefinitely but provides that a grower wishing to withdraw from the association may cancel his contract at the end of any crop year upon giving thirty days notice. The contract includes a penalty clause which provides that if the grower fails or refuses to deliver his crop to the association he shall pay to the association, as liquidated damages, an amount equal to the service charge of the association which charge, this year, is fifty dollars per car, an amount equivalent to approximately eight cents per bushel. This amount may be deducted from any money in the possession of the association due the offending grower or may be a charge against the grower's note.

With regard to tempting outside offers, the contract provides that if a member is offered by some outside concern a price in excess of the price then obtainable by the association, he shall turn over such offer to the association to be filled by it from said growers' potatoes. This clause is meant to nullify the efforts of opposing concerns in any effort to discredit the association by paying temporarily more than the market will allow.

The Pooling System

The marketing scheme includes an arrangement by which sales shall be pooled. The length of the pooling period and other details in connection are matters which are left with the board of directors. The contract does not stipulate that the member must accept the pooling arrangement; any grower may have a separate account if he so desires, but the board recommends that members accept the arrangement and enter the pool. There has been no opposition thus far, in fact, the general sentiment seems to be strongly in favour of the pooling arrangement. The directors of the association decided upon a semi-weekly pool for the early crop and a weekly pool for the late crop. The semi-weekly pool period running from July 1 to August 15 and the weekly pool for the remainder of the year. Seed and fancy grades of potatoes are not included in the pool, and f.o.b. sales and "rollers" are treated separately; otherwise the regulation provides that the returns for all shipments of like variety and grade are to be pooled. There is a feeling among the growers that the pooling period will eventually be lengthened, the longer period being thought to conform more nearly to the ideals of co-operation.

Grading and Inspection

It is the determined policy of the association to grade all shipments, adopting the grades recommended by the Dominion Fruit Commissioner.

There are three grades in the standard adopted, Canada A, Canada B and Canada C.

"Canada A shall consist of sound, reasonably mature potatoes, of similar varietal characteristics, which are practically free from dirt or other foreign matter, frost injury, sunburn, abnormal growth, growth cracks, cuts, scab, blight, soft rot, and damage caused by disease, insects or mechanical or other means.

"The diameter of potatoes of the round varieties shall not be less than one and seven-eighths ($1\frac{7}{8}$) inches, and of potatoes of the long varieties, one and three-fourths ($1\frac{3}{4}$) inches, provided that

not over twenty per cent (20%) by weight of any lot shall be less than two and one-quarter (2¼) inches in diameter.

"In order to allow for variations incident to commercial grading and handling, five per cent by weight of any lot may be under the prescribed size, and in addition, six per cent by weight of any such lot may be below the remaining requirements of this grade; but not more than one-third of such six per cent, that is to say, not more than two per cent by weight of the entire lot, may have the flesh injured by soft rot.

"Canada B grade shall consist of reasonably mature potatoes of similar varietal characteristics, which are practically free from dirt or other foreign matter, frost injury, and soft rot, and which are free from serious damage caused by sunburn, cuts, scab, blight, dry rot, or other disease, insects or mechanical or other means.

"The diameter of potatoes of this grade shall be not less than one and one-half (1½) inches, but not over twenty per cent by weight of any lot of the specified minimum size (1½ inches) may be included.

"In order to allow for variations incident to commercial grading and handling, five per cent by weight of any lot may be under the prescribed size, and, in addition, six per cent, that is to say, not more than two per cent by weight of the entire lot, may have the flesh injured by soft rot.

"Canada C grade shall consist of potatoes which shall be not less than one and one-half (1½) inches in diameter."

Alberta has suffered considerably, in the past, as a consequence of misrepresentations and through not having a systematic grading policy. It is the purpose of the association to correct this condition, at least so far as the shipments of the association are concerned. The brand of the association will be carefully guarded and every effort will be made to win the confidence of the trade and establish a reputation for reliability of pack. All cars are being inspected before shipment by a potato expert who is in the employ of the association. This inspector has the power to reject cars and require re-grading when necessary.

Over one thousand acres of potatoes are being grown by the members now in the association, and the season's shipments will probably total 300 or more cars.

Association Agreement

THIS AGREEMENT, made and entered into at Edmonton on this.....day of.....A.D. 192.., between the EDMONTON POTATO GROWERS' LIMITED, formed under the laws of Province of Alberta, having its principal place of business at Edmonton, in the said Province (hereinafter referred to as the Association), and..... a member of said Association, of .... in the Province of Alberta (hereinafter referred to as the Grower.)

WITNESSETH THAT for and in consideration of the outlays incurred and to be incurred by the Association in providing means and facilities for handling and marketing potatoes and other farm products, including the expense to which it has been put in finding and organizing and establishing markets, and in further consideration the mutual obligations of the respective parties hereto, it is hereby agreed as follows:

1. That the Grower appoints said Association his agent for the purpose of handling, grading and marketing all the marketable potatoes and other farm products such as..... .... grown by him, except what he may use for home consumption, for feed and seed, or sell in less than carload lots for local consumption and distribution. This shall be construed and accepted to mean that marketable potatoes must neither be sold nor delivered to individuals or concerns, who make a business of collecting and shipping potatoes or other farm produce by the carloads, and

That the Grower will deliver his marketable potatoes and other farm products, herein contracted, at the Association's shipping station at.....

in said Province, in such quantities and condition and at such times as the Association or its agent and the undersigned Grower may agree upon, during the life of this contract.

On or before July 1 of each year the Grower shall report to the Association the acreage to be grown by him that year, of potatoes and other farm products covered by this contract. If the Grower reports of vegetables, not specially mentioned above in this contract, such report shall be construed and accepted to indicate his intention to include such produce in his contract in the future, on the conditions and terms covered by this contract. During the growing season the Grower shall furnish such information concerning said potatoes and other farm products as may be requested by the Association.

2. That either party may cancel this contract on the first day of July of any year, after giving notice in writing to the other party of the intention to do so, such notice to be given at least thirty (30) days prior to said date. Upon such notice, the Grower shall, prior to said first day of July, pay any indebtedness then due from him to the Association, and deliver his copy of said contract to said Association, and the same shall thereupon be cancelled; but such cancellaton shall not affect any incompleted sales or transactions between the parties hereto, nor release either from any indebtedness then unpaid or thereafter accruing under this contract, nor release the Grower from his obligation to sell through the Association, nor the Association from its obligation to handle all the potatoes and other farm products described in Section 1, which were grown during the preceding season.

3. The harvesting, grading, inspecting, storing and shipping of the potatoes and other farm products shall be done in accordance with the by-laws and rules of the Association now in existence or hereafter in effect.

4. That all potatoes and other farm products delivered by the Grower may be marketed in assorted lots or with other potatoes and farm products of like character and the proceeds of any or all shipments may be prorated with the proceeds of any other potatoes and other farm products of like variety and grade marketed by the Association, during such periods as the Board of Directors from time to time may determine. Provided that nothing in this paragraph, nor elsewhere in this contract shall be construed to deny or abridge the right of the Grower to deliver to the Association for sale on separate account any potatoes or other farm products that said Grower may elect to withhold from the above provided for pooling arrangements.

5. That the Association shall have a lien upon the potatoes and other farm products hereby contracted by the Grower to be delivered to the Association, for any indebtedness of any kind owing by him to the Association, and any such indebtedness shall be deducted out of the net proceeds of the sale of such potatoes and other farm products.

6. That the Grower will not sell or otherwise dispose of his potatoes and other farm products covered by his contract (see also section 1) to any purchaser except through the Association, unless such potatoes and other farm products be rejected by the Association. In case the Grower is offered a price in excess of the price then obtainable by the Association, he shall turn over such offer to the Association to be filled by it from said Grower's potatoes or other farm products covered by this contract.

7. That the potatoes and other farm products covered by this contract shall be marketed by the Association wherever a market may be found which in its judgment, and in accordance with its by-laws and rules shall justify such marketing. The Association shall not be liable for any damage that may be sustained through act of God or public enemy, or accidents in shipment or storage, or unavoidable failure to secure suitable storage or markets for the proper handling and storing and marketing of said potatoes and other farm products. Any loss to any shipment occasioned by a Grower through improper packing, grading or otherwise shall be borne by said Grower.

8. That the Grower will pay the Association its regular charges for its services, including handling, storing, shipping and marketing, which charges are to be fixed by the Board of Directors of the Association, and which shall be in amount sufficient to pay all expenses of rendering such services, including the overhead expenses of the Association. The Grower gives the Association the right to deduct the amount necessary to cover such charges from the returns received for his potatoes and other farm products paying him the balance.

9. That in case the Grower shall at any time fail to fulfil any of his obligations under the provisions of this contract, including the failure to deliver

the said potatoes and other farm products to the Association as hereinbefore provided, any claims arising from such failure to meet his obligation, shall be a charge against the Grower's note given by him to the Association in accordance with its by-laws, and

That if the Grower fails or refuses to deliver to the Association, for marketing and distributing, the potatoes and other farm products required by this contract, he shall pay to the Association, as liquidated damages, an amount equal to the service charges of the Association as determined under the provisions of Paragraph 8, for each cwt. of potatoes and other farm products not so delivered. Said sum may be deducted from any money in the possession of the Association due the Grower, and shall also be a charge against the Grower's note as above provided.

10. That in case the manager at any time should meet with unforeseen difficulties in the marketing, he may authorize the Grower to sell in his own initiative. This clause may be revoked at any time by a vote of the Board of Directors.

In witness whereof the said parties have executed this contract in duplicate this day of 192 .

EDMONTON POTATO GROWERS, LIMITED,

By.....President.

By.....Secretary.

.....Grower.

PROVINCIAL AGRICULTURAL LEGISLATION, 1921

Synopsis of Acts Relating to Agriculture—Appropriations for Agriculture

MANITOBA

An Act to Amend the Co-operative Associations Act: The amendments to the Co-operative Associations Act, 1916,—

(*a*) Make possible the establishment of "locals"; that is, groups of shareholders of an Association organized for the purpose of doing local business.

(*b*) Provision is made that an Association selling goods by wholesale may grant credit.

(*c*) The directors may pledge the credit of the association, but no bonds, debentures or similar securities shall be issued.

(*d*) All co-operative associations carrying on business in the province are required to come under the Act.

An Act to Amend the Dairy Act, 1915:

(*a*) The amendments call for the subscribing of eight thousand, instead of four thousand, dollars worth of shares before incorporation of an Association for manufacturing dairy products.

(*b*) The limit as to the value of shares which any member may hold is altered.

(*c*) Provision is made for licensing operators of milk and cream testing apparatus.

(*d*) Provision is made for fixing grade standards and descriptions of milk and cream and for grading of these products.

An Act to Amend the Manitoba Farm Loans Act, 1917:

(*a*) The share capital of the Manitoba Farm Loans Association is changed to $550,000.

(*b*) The rate of interest to be charged on loans is limited to seven per cent instead of to six per cent.

An Act to Amend the Home Economics Societies Act, 1916:

(*a*) The name of these societies is changed to "Women's Institutes".

(*b*) The Institutes are given power to hold property, etc.

(*c*) Provision is made for dissolution of Institutes.

The Horticultural Societies Act: This Act incorporates the Manitoba Horticultural and Forestry Association and provides for the organization of local horticultural societies and their affiliation with the Association. Regulation of the activities of the Association and local societies is provided for. Provision is made to pay provincial government grants of money equal to 60 per cent of the money actually paid out in prizes at horticultural exhibitions, as well as a further grant to local societies on the basis of membership fees paid.

The Noxious Weeds Act: Previous noxious weeds legislation being in need of consolidation, former legislation was repealed and a new Act substituted. In the new Act a reduction from five to four months is made in the length of time during which a municipality must annually engage a noxious weeds inspector. A form of oath for noxious weeds inspectors is now prescribed. In cases where action is taken to have weeds cut down, power is given inspectors to see that the weeds are also destroyed in order to prevent the spread of seeds. Instead of the Act being administered by a board of Commissioners, the matter is now in the hands of one weeds administrator. The power to levy a special tax against weed infested land, unless given weed eradicative treatment, formerly vested in the Weeds Commission, is now transferred to the municipal council.

An Act to Amend the Rural Credits Act: The Act is amended to permit of money being loaned to cover one half the cost of erecting silos.

An Act to Enable Municipalities to Borrow Limited Amounts of Money for Seed Grain Purposes: A similar Act to this, passed year by year, provides annually for relief, through the municipalities, of persons requiring assistance in obtaining seed grain.

An Act to Amend the Sheep Protection Act: Under this Act the owner of sheep worried by dogs may, under certain conditions, recover partial damages from the municipality. By this amendment the length of time for filing notice of the loss is limited to 48 hours.

Agricultural and Community Districts Act: This Act is to permit of the erection of agricultural and community districts. These districts are bodies corporate and have power to provide community buildings and to acquire and equip grounds for agricultural or athletic purposes.

An Act to Authorize the Borrowing of Certain Moneys for the Purposes of Making Advances to the Brandon Winter Fair and Live Stock Association Limited: This Act is passed to permit of financial assistance being given to the corporation which holds the Brandon Winter Fair.

An Act to Amend the District Hail Insurance Act: The District Hail Insurance Act, 1920, provides for the establishment, upon favourable vote in thirty-five or more municipalities, of a Hail Insurance District. Such a district not yet having been established, the amending act of 1921 is intended still to permit of the establishment of such a district.

AGRICULTURAL APPROPRIATIONS

	1919-20	1920-21
Salaries	$ 14,800	$ 15,100
Supplies and Expenses	2,500	2,500
Agriculture and Statistics	199,670	197,920
Manitoba Agricultural College	306,050	355,458
Immigration and Colonization	20,000	20,000
Agricultural Publications	23,500	23,500
Game Branch	10,000	10,000
Miscellaneous and Unforeseen	3,000	3,000
Birtle Demonstration Farm	3,830	5,670
Settlers Animals Purchase Act	9,140	9,320
Fire Relief	.....	25,000
Supplementary	65,438	138,400
	$657,928	$805,868

AGRICULTURAL INSTRUCTION GRANT, 1921-22 (FEDERAL)

1. Agricultural Representatives	$ 8,000 00
2. Dairy Work	8,000 00
3. Poultry Work	4,000 00
4. Boys' and Girls' Club	16,000 00
5. Short Courses	19,000 00
6. Women's Institutes and Home Economics	15,000 00
7. Soil Analysis and Survey	1,000 00
8. Beekeeping	3,000 00
9. Killarney Demonstration Farm	4,000 00
10. Contingencies and Miscellaneous	1,113 11
Total	$79,113 11

SASKATCHEWAN

NO NEW Acts relating to Agriculture were passed by the Province of Saskatchewan in 1920. The amending Acts passed are for the most part of secondary importance. These amendments are entitled as follows:—

An Act to Amend The Agricultural Societies Act;

An Act to Amend The Agricultural Co-operative Associations Act;

An Act to Amend The Agricultural Aid Act;

An Act to Amend The Live Stock Inspection Act;

An Act to Amend The Horse Breeders' Act;

An Act to Amend The Stray Animals Act;

An Act to Amend The Saskatchewan Farm Loans Act;

An Act to Amend The Farm Implement Act: Under this amendment farm implements are defined as including traction and portable engines of a certain horse-power; power operated grain separators, engine ploughs and discs and all traction operated farm and road making machinery. Vendors are required to carry a sufficient stock of repair parts.

An Act to Amend The Dairy Products Act;

An Act to Amend The Egg Marketing Act.

AGRICULTURAL APPROPRIATIONS

	1920-21	1921-22
Assistance to General Agricultural Interests	$ 93,500	$ 93,500
Assistance to Live Stock Industry	189,200	42,100
Assistance to Dairy Industry	22,000	21,000
Publicity and Statistics Work	18,000	18,000
Improvement and Protection of Field Crops	454,500	41,500
Game Protection and Museum	27,300	37,300
Co-operation and Markets	12,500	16,000
Film and Stereopticon Service	.....	12,000
	$817,900	$283,400

DETAILS OF MAJOR SERVICES

	1920-21	1921-22
Assistance to General Agricultural Interests—		
Expenditure under Agricultural Societies Act	$ 80,000	$ 85,000
Grants for Seed Improvement (to be recouped)	7,000	7,000
Assistance to Live Stock Industry—		
Administration of The Horse Breeders' Act	9,000	12,000
General Services	154,000	4,000
Saskatchewan Winter Fair Board	8,000	10,000
Assistance to Saskatchewan Live Stock Association	1,800	2,100
Destruction of Wolves	6,000	1,000
Assistance to Dairy Industry—		
Administration of The Dairy Products Act and General Services	13,000	12,000
For Advancement of Poultry Interests	5,000	.....
For Promotion of Cow Testing	.....	5,000
Improvement and Protection of Field Crops—		
Advancement and Methods for Control of Noxious Plants and Insects	405,000	25,000
To promote the use of Improved Seed	2,000	4,500
Gopher Destruction	4,000	4,000
To provide Exhibits at Fairs	5,000	5,000
Co-operation and Markets—		
Administration of The Agricultural Co-operative Associations Act	3,000	2,500
To promote Co-operative Marketing of Farm Products	5,000	8,000

AGRICULTURAL INSTRUCTION GRANT, 1921-22 (FEDERAL)

College of Agriculture

1. Staff Salaries—Research and Extension Service	$19,209 49
2. Women's Work—Homemakers' Clubs	7,500 00

Instruction and Demonstration

3. Animal Husbandry	8,000 00
4. Dairying	6,000 00
5. Demonstration Trains	9,000 00
6. Agricultural Representatives	3,209 50
7. Veterinary Short Course	500 00

Elementary Agricultural Education

8. Agricultural Instruction in Public, High and Normal Schools, Household Science, Training of Teachers, Nature Study	20,709 49
9. Grants to Schools operating departments in Household Science	3,000 00
10. Expenses of Officials at School Fairs	3,000 00
11. Post Graduate Course in Agriculture, Agricultural Scholarships	1,600 00
Total	$81,728 48

ALBERTA

An Act to Amend the Municipal Districts Seed Grain Act.—No advance shall be made after the first day of January 1921 except as follows: (*a*) Any municipal district may advance in respect to any quarter section for use in 1921 seed grain to the value of $100 or less. (*b*) No advance shall be made which together with prior advances shall have effect of charging any quarter section with a greater sum than $900. (*c*) No advance shall be made to any person who is not the registered owner in fee simple of the quarter section in respect of which the advance is sought except with the consent of the registered owner.

The Secretary Treasurer shall take from every person to whom seed grain is supplied a demand note and a written agreement for a lien in form provided, in favour of the municipal district

upon all crops grown upon the lands mentioned in his application during the year in which the notice is given.

When a municipality files or has filed a lien in any year, such municipality shall in every year thereafter have a lien (*a*) Upon all crops grown from seed advanced (*b*) Upon the land named in the application except where the applicant is not the owner (*c*) Upon all crops grown upon the land named in the application except where the advance was made to a person who was not at the time of the advance the owner of the land and the land has ceased to be in the occupation or possession of such person.

It shall be the duty of the Secretary-Treasurer to enforce any lien if the amount due under the note be not paid prior to the 15th day of October of the year in which the note is given and the remedies provided by The Municipal Districts Act for the collection of taxes will apply.

In the event of monies advanced under the Act not being repaid before the 31st day of December next following the advance, the Municipal Districts shall, unless otherwise directed by the Minister, borrow an amount sufficient to repay the person, bank or corporation that made the advance and shall issue debenture or debentures to secure the same. Full directions are given as to the form, term and repayment of such debenture or debentures.

An Act Representing Advances for the Purchase of Feed for Assistance of Farmers and the Securities for Repayment thereof.—The Act contains the same provisions as that of 1920, the only difference being as to dates and that in 1921 not more than $50 worth of goods shall be advanced to any one person.

The Seed Grain Act, 1921.—This Act contains the same provisions as that of 1920 the only difference being that the dates are changed and that in 1921 the limit of seed for a quarter section shall not exceed $100 worth, nor the total advances for seed grain and feed $900, and that the provisions of the Dower Act shall not apply to mortgages under the Act.

An Act to Amend the Agricultural Societies Ordinance.—A new society shall not be formed unless its chief place of business is at least twenty-five miles from the chief place of business of any existing society.

To each society of over one hundred paid-up members the grant by the government is fifty cents per member up to two hundred members.

To each society holding an exhibition whose total expenditure for prizes exceeds $400 in the case of the first exhibition, and exceeds $500 in subsequent exhibitions, the grant is 60 per cent of the amount actually paid out for prizes, but not exceeding $3,000. To a society holding a winter exhibition of poultry, the grant is 60 per cent of the amount paid in prizes without limit as to total. To a society holding a horticultural exhibition or a combined field crop and clean seed exhibition or a spring stallion show, the grant is 60 per cent of the amount paid in prizes, not exceeding $300 for each. For a field grain competition 60 per cent not exceeding $250 and for a good farms competition 60 per cent not exceeding $100.

An Act to Amend the Stallion Enrolment Act.—No person, partnership, form or corporation shall stand, travel or offer for services any grade stallion within the area in the Province bounded on the north by the North Saskatchewan River, and certain other exempted areas.

Provision is made for the cancellation of certificates of enrolment in certain cases, for liens on foals and for the collection of service fees in the case of mares leaving the province.

An Act to Amend the Veterinary Act.—Graduates of any veterinary

school or college approved by the Senate of the University of Alberta who have passed the examination prescribed by the Senate and who present to the Association a certificate to that effect signed by the Registrar of the University shall be entitled to be registered as veterinary surgeons.

The said Senate shall control the conduct of and all matters relating to the examination of candidates and may approve of certain veterinary schools or colleges as places of instruction, prescribe the conditions upon which any veterinary school or college may be approved, prescribe the subjects upon which candidates shall be examined, determine the fee which shall be payable by candidates and make rules and regulations respecting the times when examinations shall be held and respecting the applications of candidates therefor.

The right of a candidate to appeal from the Board of Examiners to the Minister has been struck out.

An Act to Amend the Live Stock Encouragement Act.—More rigid measures are provided for the collection by the government of moneys due for the purchase of live stock under the Live Stock Encouragement Act.

The Domestic Animals Act.—This Act provides definite restrictions for all stock driven along highways and running at large, with laws against any farm animals being driven off with herds. No round-ups may be held without the consent of the Minister of Agriculture. This Act supersedes all existing pound by-laws and makes uniform all fence regulations.

An Act to Provide for the Registration of Names of Homes.—The registration of names of homes is provided for by this Act, such names to be exclusive and shall attach to the land unless legally relinquished on transfer of the home, protection being given to names already carried by ranches and stock farms.

An Act to Amend the Municipal Hail Insurance Act.—Municipal hail insurance is extended to December 30, and the insured may by due notice at any time before the crop is damaged increase his insurance from $6 to $8 or $10 an acre.

The Improvement Districts Act.—Consolidates former laws in conformity with the organized municipalities, with the minister in the relative position of the local municipal council.

Several Acts were passed relating to Land Irrigation and Drainage regarding which it is not practicable to give a summary. A printed synopsis may be had on application to the provincial authorities. The titles of these are:—

The Water Users' District Act, 1920;

An Act to Amend the Irrigation Districts Act, 1920;

An Act Respecting Drainage Districts;

An Act to Assist Certain Drainage Districts.

APPROPRIATIONS FOR AGRICULTURE

	1921	1920
Agricultural Societies	$130,000	$110,000
Expenses of Officials Judges at Agricultural Exhibitions	11 000	9,000
Live Stock and Agricultural Institutes and Short Course Schools	24,000	10,000
Production of Seed Grain	9,800	12,000
Live Stock Encouragement Act	24,000	24,000
Agricultural Agents and Destruction of Noxious Weeds	35,000	25,000
Stock Inspection	35,000	30,000
Brands and Publication of Official Brand Book	16,000	14,000
Administration of Stallion Act	16,200	10,000
Collection of Agricultural and other Statistics	6,000	4,500
Protection of Game	30,000	25,010
Dairying	37,000	33,200
Operation of Schools of Agriculture and Demonstration Farms	184,500	128,000
School Fairs and Grants to same	17,500	.....
Expenditure under Prairie Fires Ordinance	3,000	3,000
Publicity Commissioner's Office	25,000	25,000
Poultry Industry	18,000	17,500
Women's Institutes	18,000	15,000
Miscellaneous Grants	17,050	16,800
For Encouragement of Draft Horse Breeding	6,000	.....
Immigration and Exhibits	10,000	10,000
Contingencies, etc	4,500	4,500
To provide for Bonuses	22,000	12,000
Transferred	.....	1,800
	$699,550	$540,310

AGRICULTURAL INSTRUCTION GRANT, 1921-22 (FEDERAL)

Schools of Agriculture	$40,000 00
Women's Work	9,500 00
Agricultural Representatives	14,900 00
Poultry and Egg Marketing Services	2,500 00
Miscellaneous	65 62
	$66,965 62

BRITISH COLUMBIA

An Act for the Protection of Breeders of Goats.—The term "pure bred" relates to animals registered in the Canadian National Record for Goats at the Live Stock Records Office at Ottawa, or in the records of any goat record association eligible for register in the Canadian National Record.

Breeding sires may not be offered unless pure bred. For the first two years of operation of the Act, a pure-bred sire and grandsire is sufficient to qualify. During the third and fourth years the ancestry is further extended.

Minor amendments were made to the "Agricultural Act, 1915," to the "Animals Act," and to the "Brand Act, 1917."

AGRICULTURAL APPROPRIATIONS

	1920-21	1921-22
Minister's Office	$ 11,380 00	$ 11,440 00
General Office	35,658 00	34,996 00
Horticultural Branch	101,840 00	93,540 00
Live Stock Branch	64,632 00	73,462 00
Statistics	4,720 00	4,720 00
District Agriculturists, etc	17,380 00	16,270 00
Miscellaneous Grants, etc	118,073 75	152,350 00
	$353,683 75	$386,778 00

AGRICULTURAL INSTRUCTION GRANT, 1921-22 (FEDERAL)

Dry Farming Demonstration Stations and Field Crops	$ 500 00
Seed Work	500 00
Silo Demonstrations	1,750 00
Horticultural Demonstration and Competitions	1,000 00
Fruit Packing and Pruning Schools	500 00
Poultry	750 00
Dairying and Cow-testing	9,000 00
Beekeeping	9,000 00
Boys' and Girls' Clubs	800 00
Agricultural Journal and Publications Branch	6,000 00
Pathological and Entomological Branch	6,000 00
Miscellaneous	399 06
Agricultural Instruction in Public, High and Normal Schools; training of teachers, grants	10,000 00
University of British Columbia, College of Agriculture, Extension and Investigation	23,000 00
	$69,199 06

PRINCE EDWARD ISLAND

AGRICULTURAL INSTRUCTION GRANT, 1921-22 (FEDERAL)

1. Agricultural Buildings, Equipment and Maintenance	$ 1,050 00
2. Director and Agricultural Representatives	4,300 00
3. Short Courses	500 00
4. Drainage, Soils and Crops	4,700 00
5. Live Stock and Dairying	3,000 00
6. Poultry, Horticulture, Beekeeping and Co-operative Marketing	500 00
7. Women's Institutes	3,200 00
8. Elementary Agricultural Education, Agricultural Instruction in Public and High Schools, Training of Teachers, Allowances, Grants, Maintenance of Rural Science Department, Prince of Wales College	12,100 00
9. Contingencies and Miscellaneous	2,399 22
Total	$31,749 22

WINTER COURSES IN AGRICULTURE—ONTARIO

Suggested Improvements in Agricultural Representatives Courses for 1922

BY C. C. MAIN, B.S.A., AGRICULTURAL REPRESENTATIVE, LENNOX AND ADDINGTON COUNTY

AT the annual conference of agricultural representatives held at the Agricultural College, Guelph, this past summer, a committee was appointed to consider the Courses in Agriculture and Domestic Science. They were given the power to pass any resolutions which they considered would be of value in improving the instruction imparted at their winter courses. The report they submitted, which will be carried out by all the agricultural representatives this winter, is as follows:—

1. *Assistants.*—Where there are indications of a large class in agriculture, or where, by reason of transportation difficulties much time would be lost by the assistant going from county to county, it is recommended that permanent assistants be appointed covering the duration of the course.

2. *Special Lecturers.*—Individual representatives alone know the lecturers most suitable for their class, and therefore the custom of selecting special speakers from a list similar to that furnished each office last year might advantageously be continued. Further it is urged that the practice of sending

extra speakers, other than those asked for, to the courses be discontinued.

3. *Demonstration Material and Equipment.*—It is urged that more charts should be available for class room purposes. There is need in some counties for collection of plant diseases, for soil testing equipment, etc.

4. *Joint Sessions.*—Where possible it is advisable to have Domestic Science and Agricultural Courses run concurrently. The sessions should be held separately unless the classes are small.

5. *Excursions, Banquets, etc.*—Where possible, features of this kind should be arranged. The practice in vogue in most counties of holding literary meetings is strongly commended.

6. *Junior Farmers' Improvement Associations.*—The organization of J.F.I. associations before the class disbands is recommended.

7. *Other Courses.*—It is recommended that not more than one four weeks' course be undertaken by a representative.

Aside from the above report, representatives will, no doubt, introduce new features to suit their particular counties. It is indeed difficult to lay down any hard and fast rule for a winter course in agriculture. The kind of education that is needed in one county is not at all applicable in another county, and this phase of the work must be worked out entirely at the discretion of the agricultural representatives in their various counties. For instance, some counties are particularly interested in horticulture, others in beef raising, others in dairying, and so on.

Illustration Material Necessary

One of the greatest needs in our winter courses in agriculture is for more illustration material similar to the "Wilson Meat Charts" on beef cuts, pork, mutton, and lamb cuts. Demonstration material relating to almost every subject discussed could be used very advantageously in imparting to the pupils in a very instructive way the most opportune information of the day. For instance, in my particular county, I could use an up-to-date insect collection with particular stress laid on the most important insects that are doing damage to farm crops. When we have a new outbreak of insect injury, such as the corn borer, a specimen of the larvae in alcohol, showing the pupil exactly what they look like, would be of inestimable value to the students. Charts could be prepared by the Field Husbandry department showing the latest and best varieties of different classes of farm grains to grow. These would be of great value in teaching field husbandry. Charts could be prepared by the Animal Husbandry department showing the breeds of live stock that are most popular on Ontario farms. Comparative charts showing the scrub versus the pure bred would be of great educational value, and charts, illustrating the benefits to be derived from using pure bred sires on grade dams, would be of great assistance. Another feature of agricultural education which might be improved for the benefit of all concerned is the Motion Picture Bureau. I do not believe that the representatives have as many reels illustrating the various phases of agriculture as they would like to use in connection with the winter courses. Students, attending agricultural courses, should receive a thorough training in testing milk and cream and should be made familiar with The Dairy Standards Act. It is also a good policy, I believe, to deal with all agricultural legislation passed by the legislature during the preceding year. In this way, students are informed regarding the laws that pertain particularly to the farmers.

Problem Study

A feature which I introduced last year at the winter course was what we termed "Home Problems." Each student in the class was requested to set down in writing the ten most important

problems concerning which he or his father wished detailed and full information in connection with the practical operation of their farm. These questions were dealt with separately and fully, and provided the class with a great deal of valuable information on the problems confronting them in their every-day farm life.

Another feature, which I hope to introduce this winter, will be the problem of figuring out the cost and maintenance of products on the home farms. Certain students will be given definite problems to work out. For instance, one will be asked to keep an accurate and detailed statement of the cost of feeding a team of general purpose horses for one month; also to keep a record of the work they perform, and estimate the value of that work towards increasing the income of the farmer. Another student will be given the problem of figuring out what it costs to feed a dairy cow for a month, and will be asked to keep a record of the milk she produces, and the value in dollars and cents which it represents towards increasing the income of the farm. Other problems will be as follows: figuring out the cost of feeding sheep, swine, beef cattle, poultry, etc.

The Practical Side

Another new feature, which undoubtedly would be a great help to the students of winter courses in agriculture, would be to have the leading and most successful farmers in the various branches of farming most extensively practised in the county, address the class on exactly how they manage their farms. These men are living right in the neighbourhood under the same conditions as the students themselves, and the methods that they have proved to be successful in their practical farming operations would undoubtedly prove successful with the new students just starting farming. What these practical farmers would have to say would perhaps carry greater weight than addresses given by outside men.

It appears to me that a full course of study of markets and market requirements would be a great help in assisting the students to market their products to best advantage. Young farmers are not familiar with the market requirements of the various classes of live stock, and judging competitions on the hoof, followed with killing demonstrations and judging competitions on the dressed carcasses, would bring out the points to be emphasized in catering to our higher class markets.

It is a good idea to encourage students to take an interest in reading. A circulation library may be formed and books loaned to the students for certain set periods. A library may be the means of getting the students to read and think for themselves, which is a very important factor in securing an education, agricultural or otherwise. Departments of Agriculture publish a large number of bulletins which give detailed information on a wide range of subjects, but it is surprising the number of practical farmers who do not know where to write to obtain the desired information regarding subjects in which they are particularly interested. Students should be informed as to where such information may be obtained, as the knowledge is bound to be great value to them.

MINISTER OF AGRICULTURE FOR ALBERTA

THE new Minister of Agriculture for Alberta, Hon. George Hoadley, brings to his office a wealth of practical experience and sound judgment. The portfolio which he holds is undoubtedly the most important portfolio in the Provincial Government. A province such as Alberta must depend upon agriculture as the foundation of its prosperity, and a live Department of Agriculture may exert a very powerful influence on the progress of farming generally. A new province such as Alberta naturally has numerous agricultural problems which must be faced with courage, determination as well as foresight and judgment. Hon. Mr. Hoadley seems to combine these qualities in a very remarkable degree and as a result we are quite sure that his influence will find expression through the various branches of the Department of Agriculture.

Hon. George Hoadley was born in England and emigrated to Canada thirty-one years ago, coming direct to the Prairie West. He located near Calgary, and being attracted by the rich native grass and by the favourable climate, decided to enter the live stock business. Since then he has been continually in the horse ranching and farming business in the vicinity of the foothills, having bred up a substantial and useful herd of farm horses. He has been an active member of practically all of the live stock and agricultural associations since their establishment, having taken a particularly prominent part in the live stock associations, and is at present the Vice-President of the Western Canada Live Stock Union. He has represented the constituency of Okotoks in the Provincial Legislature for the past nine years, and during a portion of that time was Leader of the Opposition in the Provincial House. He has taken a very active interest in the farmers' movement for several years past and contested his riding as the farmers' candidate in the recent Provincial contest, being elected by a large majority.

PART III

School Agriculture and Related Activities

AGRICULTURAL EDUCATION IN CANADA—*Concluded*

BY J. B. REYNOLDS, M A., PRESIDENT ONTARIO AGRICULTURAL COLLEGE

The Agricultural Schools

An agricultural school, as distinct from an agricultural college accepts students without requiring a definite academic standing, and offers a course which does not in that school end in a degree. Of the agricultural schools in Canada, the chief are the school of agriculture at Truro, Nova Scotia, the school at Kemptville, Ontario, and six schools in Alberta. Besides these, most of the agricultural colleges offer two or three-year school courses in addition to the college course. A glance over the curricula of these schools, and a comparison of them with the curricula of agricultural colleges reveals close similarity. The work is different in extent and in degree, not in kind. The college work is of course more advanced, with an emphasis on the science of agriculture, while the school work emphasizes the art. Also, the college adds certain subjects, such as rural sociology and economics. The close relation possible between school agriculture and college agriculture is shown by the fact that the premier agricultural college in Canada, the Ontario Agricultural College at Guelph, has for thirty-two years—from 1888 to 1920—made its two-year school course coincide with the first two years of the four-year degree course. Manitoba followed the same plan from its inception in 1906. Admission to the third year of the degree course was granted to those who had obtained a fifty per cent proficiency on all second year work, and sixty per cent in English. Under present regulations, the school course is entirely separated from the college course, both in conditions of entrance and in curriculum. The purpose of the agricultural school course is to add agricultural science and a general education to the practical experience of the farmer gained on his farm, so that he may be the better fitted to deal with the problems of farm production, to handle the business of farming, and to be a useful member of the country community. That is, the two-year course is designed primarily and chiefly for those who intend to farm.

It may reasonably be supposed that the work of the school of agriculture could be accepted as a preparation for the college of agriculture, in the same way that the public school prepares for the high school, and the high school for the university. There are, however, certain important considerations to be taken into account here. The course in the school of agriculture is supposed to be complete in itself, to present the results and not the methods of agricultural chemistry, botany, plant breeding, and the other sciences applied to agriculture. Also, the school admits students without any prescribed academic education, and gives a technical course with a minimum of academic subjects. Hence the agricultural school neither requires for admission nor provides in its course the necessary academic training for admission to the agricultural college. In fact, a high school course with the agricultural option is a better pre-

paration for the agricultural college than is the course given by the agricultural schools, as the work of these schools in Canada is at present constituted.

In some of the United States, there are preparatory schools that are denominated by the agricultural colleges "approved" schools, whose students are accepted by the agricultural colleges. Such schools—those in Minnesota, for example—are rather agricultural high schools, with a strong academic course along with a course in agriculture similar to the course already outlined in this paper. It would seem that the Canadian schools of agriculture may become high schools teaching the required academic courses as well as agriculture, or, be content to remain what they now are and what they mainly profess to be —offering short practical courses for those who intend to farm and who have not time to take a longer course.

There is a general feeling that the opportunity should be provided somehow whereby the agricultural college may give credit in its course of study to the work taken in the agricultural school. The school cannot, without defeating its purpose, require for admission an academic standard of education. Its doors must be wide open for the training of practical farmers in technical agriculture. The school at Truro, Nova Scotia, offers what is called a "scholastic diploma" following a course which provides some academic instruction. Usually those who have taken that course have been men who already had received some high school education. With the necessary academic standing as a pre-requisite, and with a two-year school course parallel to the first two years of the college course, candidates from the schools may be admitted to the colleges on certain conditions of extra subjects to be covered. But generally, those who are qualified to enter the college and are likely later to wish to proceed to the degree, should enter the college at the start.

The Agricultural Colleges

Both in their organization, and in their activities, the agricultural colleges of Canada have evolved in obedience to their environment. The Ontario School of Agriculture was inaugurated in 1874, as a result of the same counsel which originated the School of Practical Science. It commenced and has remained as a branch of the Department of Agriculture of the Ontario Government and is maintained by annual vote of the Legislature. In 1879 it was made the College of Agriculture, but continued offering the two-year course only until 1887, when a third year wa added, and under affiliation with the University of Toronto, the degree of Bachelor of Science in Agriculture was conferred. In 1902 the course was lengthened to four years, but no standard of admission was established. Until 1920, the two-year school course coincided with the first two years of the degree course, as explained earlier in this paper. In 1920, the two courses were separated, and of those entering for the degree course, matriculation is now required with some modifications in favour of candidates with extended farm experience and of mature age.

The Manitoba Agricultural College was organized on the same plans as in Ontario. The degree course there is five years of five and a half months each.

Neither of these institutions is a faculty of the university. Both have their own staff of teachers, for academic as well as for technical instruction, and their own premises and courses of study. The college in Manitoba is governed by a board of directors, through whom appointments, promotions and appropriations are recommended to the Government. In the Ontario Agricultural College, all these affairs are conducted by direct negotiation between the President of the college and the Minister or the Deputy Minister of Agriculture.

Macdonald College at Ste. Anne de Bellevue was built and endowed by the late Sir William Macdonald, for the

purpose of teaching Agriculture and Home Economics to English-speaking Protestants of the Province of Quebec. This college is a faculty of McGill University.

The agricultural colleges in Saskatchewan, Alberta, and British Columbia also are organized as faculties of the provincial universities. There are thus the two types of organization, the one type being organically separate from the university but affiliated with it; the other type a university faculty.

The activities of these colleges have grown in response to the public demands. The original purposes in Ontario were to teach agricultural science and practice to intending farmers and to conduct investigations in farm, garden and orchard crops and live stock, and to publish the results of these investigations. All these purposes have been continued. The degree course was added to supply a public demand for technical agriculturists, teachers in agricultural schools and colleges, directors and investigators in experiment stations, commissioners and administrators in the various branches of the federal and provincial departments of agriculture, agricultural journalists, and agricultural representatives stationed in the rural districts for the purpose of carrying the college teaching directly to the farmers.

The extent to which the agricultural colleges have widened their activities to serve agriculture and the rural communities, is indicated in the accompanying diagram. With slight variations all the agricultural colleges of Canada have developed much the same kinds of service. Agricultural extension policies are not entirely uniform in the provinces, with respect to division of work between the college and the political department of agriculture in the government. The American system is generally to centralize not only agricultural instruction but administration also, in the colleges. No definite system has been evolved in Canada as yet, and phases of agricultural extension have been appropriated in some provinces by the college, and in some by the Department of Agriculture.

College Branches	Regular Courses	Short Courses	Extension	Investigation
Animal Husbandry—	Breeding, feeding, judging, management, marketing.	Judging pure-bred and commercial stock.	Judging at fairs and exhibitions, correspondence meetings.	Breeding and feeding.
Apiculture—	Anatomy, life-history, diseases, management.	Commercial management.	Provincial supervision of the industry.	Wintering and queen rearing.
Dairying—	Science and practice in manufacture of dairy products.	Factory courses in cheese and butter making, farm dairying.	Judging, correspondence meetings.	Neutralization and pasteurization of cream for butter making.
Farm Mechanics—	Wood-working, forging, farm machinery.	Gas engines and tractors.		
Field Husbandry—	Production and improvement of farm crops.	Seed–judging	Judging correspondence meetings, Experimental Union.	Testing varieties, plant breeding.
Horticulture—	Fruit, vegetable and flower culture, landscape gardening.	Fruit growing, rural beautification.	Judging at fairs, correspondence meetings.	Testing varieties, crop researches, plant breeding.
Poultry Husbandry—	Breeding, feeding, judging, management, marketing.	Commercial management.	Judging, correspondence meetings, culling demonstrations.	Breeding and management.

College Branches	Regular Courses	Short Courses	Extension	Investigation
Farm Economics—	Farm accounting, business analysis, management.	Planning and management of farm business.	Correspondence meetings	Farm business, surveys, cost of production.
Veterinary Science—	Anatomy, physiology, materia medica.	Horse-judging.		
Bacteriology—	Of the soil, the dairy, the household.	With dairying and horticulture.	Examination of spoiled foods and diseased animal specimens.	Diseases of plants and animals; soil and dairy.
Botany—	General and economic botany, pathology, and ecology.	With field husbandry and horticulture.	Plant diseases, weed eradication.	Diseases in greenhouse, smut in grain, potato diseases.
Chemistry—	General chemistry, soil fertility, biochemistry.	With dairying and horticulture.	Food analysis, soil renovation.	Flour and bread, milk and milk products.
English—	English and Canadian literature, journalism, public speaking.		Reading courses, rural plays, debating clubs.	
Entomology, Zoology—	General anatomy and physiology, economic studies.	With bee-keeping and horticulture.	Work of Provincial Entomologist.	Corn-borer, cabbage maggot, systematic research.
Mathematics—	Mensuration, geometry, algebra, trigonometry.	With dairy course.		
Physics—	Mechanics, hydrostatics, electricity, drainage, meteorology, climatology.	Gas engines and tractors, drainage.	Field work, plans for farm drainage.	Farm utilities survey.
Political economy and Rural Sociology—	Trade, markets, co-operation, civics, community problems.	Sociology with course for rural leaders.	Co-operative enterprise.	Rural social surveys.

General Problems and Results

The developing situation in Canada has presented to those concerned in agricultural education certain economic and social problems, to the solution of which agricultural education must contribute. These problems may be stated thus:

1. To secure on the farms of Canada the continuous use of the best known farming practice.

2. To maintain conditions of rural living satisfactory to those who are intelligent enough to farm well, and generous enough to live well and to be good citizens.

That these two needs may be provided for, agricultural education has evolved, and has attempted specifically to train leaders—resident leaders and professional leaders.

The developing situation in Canadian agriculture has involved these factors:

1. A soil becoming farther and farther removed from the fertility of virgin conditions. Only good farming can maintain unimpaired the fertility of the soil. The good farmer, therefore, is confronted with a double task—

the one, in self-interest, to make a living from the soil, the other, in the public interest, to maintain undiminished the natural resources of soil fertility. The tremendous implications of this factor as it relates not only to the responsibility upon technical education, but also to that upon education for citizenship, are entirely obvious.

2. A hostility in nature against artificial improvement of plants and animals. The physical law of the Degradation of Energy, or something analogous in biology, tends to counteract the improvement of species by human selection or humanly-devised plans of breeding. The products of breeding-stations are placed in the hands of practical farmers, but unless they exercise much the same knowledge and skilful care as was required in producing the improved strains, degeneration is certain and rapid. Nature produced the wild oat, and the domesticated oat tends to revert. Natural selection has produced the moose and the bison, but not the Shorthorn or the Polled Angus. The more our farm products are the results of human selection, the greater the knowledge and skill required to hold what we have.

3. A developing industrialism, in which agriculture has found a formidable rival in the labour market. So much so, that at the present time there is no economic basis of wages in any industry except in farming. On the farm, the tendency is to pay what a man can earn. In industrialism to date the tendency is to pay what organized labour may demand, and by means of economic privileges not shared by agriculture, to pass on the costs of production to the consumer. Such conditions demand of the farmer business ability and economic knowledge not required in Canada forty years ago.

4. The growth of industrial and commercial centres, which have offered business opportunities and physical and social attraction that make the country seem dull, stale and unprofitable by comparison.

5. Our educational and social ideals which have declared that overalls do not go with dignity and respectability, and that education is a means of escape from labour.

Unsettled rural conditions have been the result of these factors. Farms have changed hands, and thus a means for continuing good farming practice has been wanting. There have been no traditions possible with a shifting farm occupancy. Whole families have moved from country to town, and there has been a similar want of rural social tradition. With this lack of permanency has followed lack of incentive for farm improvement, and for the addition of household conveniences. Thus rural utilities and rural improvement and rural beautification lag behind. Country schools have not kept pace with town schools, and country churches are dying of inanition.

These facts are mentioned as constituting the real problem of agricultural education. Each new generation of farmers has to be taught the principles of good farming, with little aid from a farming tradition. Each new rural generation has to be taught to live in the country with little aid from a rural social tradition. But in spite of all, if Canada is to maintain a stable and durable civilization, there must be maintained on the farms the best known farm practice, and conditions of living in the country must be maintained satisfactory to those who are intelligent enough to farm well, and generous enough to live well, and public-spirited enough to maintain unexhausted the soil's store of fertility.

BOYS' AND GIRLS' CLUB ORGANIZATION AND WORK IN SASKATCHEWAN

BY H. SAVILLE, ORGANIZER OF BOYS' AND GIRLS' CLUBS

THE first school exhibition in Saskatchewan was held in 1909. The development was slow for the first few years but has moved rapidly recently until in 1920 there were 262 school exhibitions held in the province at which approximately 40,000 children exhibited their work. Only a small proportion of these, however, can be classified as bona fide members of organized boys' and girls' clubs.

This year over one hundred centres —embracing several hundred schools— are carrying on boys' and girls' club work, and the present rate of progress of the work indicates that it is becoming one of the outstanding features of our educational system.

Inception of the Movement

The inception and development of Boys' and Girls' Clubs in Saskatchewan has been along somewhat different lines from those followed elsewhere in Canada. In some other provinces the showing of products of both field and classroom that culminated in the holding of organized school exhibitions and junior fall fairs, began with the exhibiting of agricultural produce and later included exhibits of writing, composition, art and other classroom work. That is, it began outside the school and gradually moved inward, and consequently agriculture and household science have held the premier position over school work in these places. In Saskatchewan the movement began inside the school and gradually worked outwards, so that classroom products have been greatly in the majority at school exhibitions up to the present time. Organized raising and exhibiting live stock, vegetables, etc., is a comparatively recent innovation and is scarcely past the experimental stage. In 1919, pig raising, poultry raising, potato growing, gardening and canning had been given particular recognition, but by 1920 it was found necessary to add calf and sheep raising, colt training and stock judging, while gardening and canning which had hitherto been conducted as one contest were divided into separate activities.

In other provinces, club projects include sewing, cooking, baking, wood working and similar training. The reason these have not yet been placed on the Saskatchewan club programme is that these activities are provided for in the regular course of school studies and it is the aim of club work to avoid overlapping and to supplement rather than duplicate instruction given in the class-room.

Recent Developments

Local administration of club work was at first exercised in most places by the agricultural society, but the tendency appeared to be to emphasize material rather than educational accomplishments. It was soon noticeable too, that the aims of the work could be better fulfilled by linking it up more closely with the school and school exhibition.

In 1918 a director of Boys' and Girls' Clubs was appointed as an assistant to the director of agricultural extension at the University of Saskatchewan.

Early in 1920 a conference was held regarding the future development of the club work, at which it was decided that since these activities were so closely related to the rural education associations and school exhibition work of the province, it would be advisable to place this phase of agricultural extension work

among boys and girls under the control of the Department of Education.

Consequently the Board of Governors of the University of Saskatchewan authorized the transfer of the boys' and girls' club work from the university to the Department of Education. In March the transfer took place, and the work was definitely incorporated with the Rural Education Association and School Exhibition system of the province. An assistant to the Director of School Agriculture was appointed as organizer of Boys' and Girls' Clubs, with headquarters at Regina.

Farm boys' and girls' camps which are attended annually by hundreds of young people remain under the supervision and direction of the University Extension Department. The Director of Extension co-operating with the provincial Department of Agriculture and the boards of the Saskatoon and Regina Exhibition Associations conducts contests in stock and grain judging, crop and weed identification, etc., for older boys, and while assistance is rendered by the Department of Education, these boys and girls and their work do not come under the jurisdiction of the Boys' and Girls' Club branch.

Departmental Assistance

Personal supervision of club work cannot be conducted locally by members of the Department of Education and it is necessary for the permanent resident of each community to co-operate with the teachers in order that the children may receive personal and individual instruction and encouragement.

Literature consisting of bulletins, instruction circulars, record cards, enrolment forms, exhibition report forms, etc., are supplied freely by the department. Instruction circulars are in the form of single-page leaflets containing concise information regarding the most approved methods of raising live stock and vegetables, canning, etc. These have been written expressly for children and can be easily understood by the youngest club members. Record cards contain about a dozen simple questions, which when answered give brief information as to the kind of stock and vegetables raised, the methods employed, the cost and value of the produce and the profit resulting from the work. This card is filled in by the raiser of the produce and accompanies the exhibit on fair day.

The department does not undertake to supply young stock, eggs, etc., to club members, but co-operating with the Department of Agriculture and the Agricultural College, assists as far as possible in giving the names and addresses of breeders who have young stock for sale.

In January, 1921, the Department of Education commenced publication of a monthly periodical entitled "The School Agriculture and Club Leader," devoted almost entirely to the interests of school agriculture and associated activities. One section of the publication deals with Rural Education Association interests, another with school exhibition affairs, a third with boys' and girls' club work and a fourth with general topics. The "Leader" is sent to all school teachers, newspapers and banks in the province as well as to every enrolled member of a Boys' and Girls' Club, and contains much timely and serviceable information of value to all interested in rural education.

SUGGESTIONS FOR PRACTICAL WORK IN THE TEACHING OF AGRICULTURE

BY NORMAN DAVIES, B.A., TEACHER OF SCIENCE AND AGRICULTURE, RENFREW COLLEGIATE INSTITUTE

WHETHER or not to have a school garden is the question facing many teachers about to begin the teaching of agriculture. The school garden is very important both to teachers and pupils. For public school work the requirement in Ontario is six square rods in order to qualify for grants, but a smaller area is worth while even if no grant is secured.

Numerous topics can be illustrated in the school garden. The method of planting, the care and harvesting of different crops can be taken; the study of insect pests and fungous diseases of plants, and methods of control; methods of conserving soil moisture, and problems of drainage; the growing of small fruits and the care of fruit trees including budding and grafting; practical work in measurement in laying out the plots; the study of common garden weeds and methods of eradication, and many other topics can be given a practical angle. The flower garden is important, for in it the methods of planting bulbs, perennials and annuals can be shown. The school garden provides the material for teaching many of the agricultural topics by the laboratory or demonstration method, so that pupils can see methods and results as well as hear about them. The teacher will also derive benefit in having actual results as a basis for the information given to the pupils. The school garden adds a zest and an interest to the work which cannot be secured by classroom work alone.

In addition to the individual plots, planted and cared for by one or more pupils, an area planted under the direction of the teacher for class purposes is worth while. Such an area might represent a kitchen garden about 60 to 80 feet long by 20 to 30 feet wide. A third of this area could be planted in permanent crops, as strawberries, raspberries, rhubarb, and so on; another third in smaller vegetables, and the remainder in potatoes, corn and tomatoes. Such a garden shows method of planting a small area and the variety and yield; while from the strawberry and raspberry patch, plants may be supplied to the pupils. Last spring, about fifteen pupils from our classes took from 50 to 100 plants for planting in their gardens at home. Next year I expect to supply a few raspberry plants and possibly some rhubarb roots.

For the past three years, I have planted in a part of the garden small plots of fall wheat and fall rye, each year planting the seed grown in the previous season. My object is to secure plants more resistant to frost and to test each year the value of a commercial fertilizer. Results have been encouraging and each year the plots of wheat came through the winter in a better condition. The rye has never been seriously harmed. The wheat always shows a higher yield on the fertilized plots, while the rye has never shown any advantage from the use of fertilizer. I use this result in classwork to point out the importance of testing a small portion of a field for each crop before investing extensively in commercial fertilizer.

Where the area of the garden is larger than required for the work already mentioned, it is worth while to plant some marketable crop. Potatoes answer the purpose, but in some localities sweet corn, tomatoes or carrots and beets might be grown very profitably. The results can be used to show that the methods taken up in the classroom are practical and the revenue assists in paying expenses. Last year

from one-eleventh of an acre, the yield of potatoes was 283½ bushels per acre. The value of the crop was $265.65 per acre and cost $157.50 per acre, giving a profit of $108.15 per acre. Such calculations based on actual results are of greater value than estimates based on the results of some one else.

This year eight varieties of potatoes have been planted—24 hills of each. One set of plots is in sandy loam, and the other in heavy clay soil. When dug, the yield from each plot will be weighed. The results will show which early and which late varieties are best suited to our types of soil. Such work opens up a wide field to the thinking boy or girl, and shows that agriculture is not a stereotyped, single-tracked occupation.

RENFREW COLLEGIATE SCHOOL GARDEN
Partial view of kitchen garden and poultry house. Eight varieties of potatoes under test.

At one corner of our school garden there is a poultry house of up-to-date construction. Chickens are kept in this building throughout the year except in July and August. The first year a small flock was secured in the fall and kept till June. During that time the value of eggs laid and value of fowl when sold exceeded cost of birds and feed by $10. Last winter, two pupils, who had raised chickens from eggs hatched at the school were given the use of the poultry house. Both have now built poultry houses at home. This winter a flock of Silver Campines will be kept. This is a new variety for this locality. They are fair layers and economical feeders. During last spring about 475 chicks were hatched in the school incubators. Many pupils brought eggs from home for early hatching while others bought Ontario Agricultural College eggs, which were secured for school work.

Such experiments as these are difficult for the public school teacher, but not at all impossible. They should be easily carried out by the high school teacher who is usually more permanently located.

Each teacher might, from among the numerous topics of the curriculum select one or more which can best be developed in the locality. For town schools, gardening and poultry work could be made the hobby, and more attention given than required by the curriculum. A hotbed belongs to garden work and could be easily prepared in connection with other garden work. If the teacher emphasizes one or two things, there will be a more real and lasting effect.

Should some of the readers feel that the work outlined stresses the economic too much, it might be well to bear in mind that we deal with the economic aspect in many other studies. Geography, history, and science all have a bearing on economic problems, and we do not hesitate to discuss them. Are we in Canada behind in this phase of agricultural teaching? In Wisconsin there is in one locality a school which supplies from its farm the seed corn for the farmers nearby; in another case the growing of hemp has become a main industry and it was first introduced by a high school principal who was the teacher of agriculture. If our teaching of agriculture is to benefit in a real sense, the need for more people in the rural districts, we must pay some attention to the economic, so that the boy or girl will have an enlightened mind on the subject and be better able to choose his or her future work. The school where agriculture is taught might become in a small way a more direct benefit to the community; not overlapping present organizations, but co-operating with them to a greater degree than at present, and secure the hearty support not only of the agriculturist, or person interested in agriculture but not engaged in practical work, but of the practical farmer as well.

NOVA SCOTIA SUMMER SCHOOL OF TEACHERS

THE Nova Scotia Summer School for Teachers of 1921 was equal to that of 1920 in some respects, and surpassed it in others. Every forenoon was devoted to classes in scientific subjects; every afternoon to field and laboratory work and to athletics, playground methods, basketry, story-telling, and folk games; every evening to social gatherings, entertainments, debates, public speaking contests, and moving pictures. Interesting lectures were delivered by a number of outside speakers who discussed the various phases of community activities in which the teacher has the opportunity to engage. The Department of Public Health supplied eight lectures. The Chautauqua programme brought a pleasing variety to the course.

According to custom a pageant was staged in which the students got a valuable practice in dramatization. This year, the pageant portrayed the growth of public schools and general education from the dawn of civilization to the present day.

The enrolment was 137, and, as usual, the excellent school spirit was all that could be desired. Enthusiasm was contagious. With such whole-hearted workers going out over the province, the outlook for school efficiency is encouraging.

BOYS' AND GIRLS' CLUB WORK IN NEW ZEALAND

A LITTLE over a year ago the first boys' and girls' clubs were organized in New Zealand, and the movement, which started in the South Taranaki district, bids fair to extend widely. Mr. J. W. Deem, Field Instructor of the Department of Agriculture at Manganui, in an article in *The New Zealand Journal of Agriculture* for July, gives a full account of the methods adopted and the results of the first contest. A committee representing the Farmers' Union, the Agricultural Department, the Education Board, and the school teachers had the matter in charge, and the success achieved was largely due to their enthusiastic and united efforts. For local supervision, a resident member of the Farmers' Union was appointed in each school district; the school teachers were asked to assist, and the writer states that, after a season's experience, he can testify to the great importance of the teachers' influence, as on their attitude largely depends the success or failure of the work.

The first contest was limited to the growing of mangolds and swedes, and it is interesting to note that the two most successful schools had a lady teacher in charge, and that the champion mangold and swede crops were grown by girls. Nineteen schools entered the competition with 140 entries for mangolds and 52 for swedes. The Department of Agriculture supplied the seeds, the manures, and the printed instructions.

In judging the crop a scale of points was used: one-half point for each 5 cwt. of roots; quality 10 points, cultivation 20 points, and records 40 points. Cultivation and records were thus made the strong feature of the work.

An arrangement was made whereby the competitors accompanied the local supervisor and judge from plot to plot. In several instances during the judging, the supervisors of adjoining clubs brought their members along. The opportunity thus afforded for comparison aroused keen rivalry, and many a competitor who had a poor plot, on seeing a good one and listening to the complimentary remarks of the judge, resolved to do better next year. Each school was allotted a first, second and third prize, while each group of schools was awarded three prizes for the three best crops in the group. There were also three championship prizes for the three best crops in the whole district. A handsome challenge shield was also presented by a business firm to the school securing the highest aggregate number of points.

In addition to field root clubs, calf clubs are being started for the coming season and are attracting good entries. Accounts that have appeared from time to time in *The Agricultural Gazette* of the methods of conducting Boys' and Girls' clubs in Canada were of much assistance in planning the work in New Zealand.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

NEWS ITEMS AND NOTES

The Right Hon. Sir A. Griffith-Boscawen, Minister of Agriculture for the United Kingdom, announces that although the Government has abandoned the policy of guaranteed prices and control of cultivation, they are determined to pursue the policy of education and research as the most permanent method of improving agriculture.

The Sherbrooke Exhibition Association this year provided competition between the displays of ex-soldiers established on farms organized by the Soldier Settlement Board. The displays consisted of farm and market produce, in which there were twenty competitors. The prizes ranged from $30 for first to $5 for sixth award.

Rural credit loans in Manitoba made this year up to July 1, amounted, for the purchase of live stock, to $111,340, for machinery $76,556, putting in and taking off crop $219,887, breaking $223,423, seed grain $138,289, improvements $65,860, retiring liabilities $459,306, sundry purposes $578,400. A sum approximating $100,000 has been subsequently loaned for land breaking and the purchase of binder twine.

The article giving an account of the "Home Making Course for Girls," which appeared on page 559 of the September-October issue, was by error attributed to the Province of New Brunswick. This account related, as the contents indicated, to the short courses for girls put on at the Agricultural College, Truro, N.S., under the direction of Miss Helen J. Macdougall, Superintendent of Women's Institutes.

As a result of the efforts of Dr. J. H. McDunnough, of the Entomological Branch, during the past summer over 6,500 specimens have been added to the National Collection of Insects. Although he did not have ideal collecting weather, he obtained some very desirable material, including species either not represented in the collection or else represented by a very poor series.

Mr. Criddle, of the Entomological Branch, reports that the wheat stem saw-fly has done serious damage this year, particularly in the southwest portion of Manitoba. Messrs. Criddle and Vroom took a long trip through the worst infested districts and reported that fields showing 70 p.c. fallen straws were encountered, whereas in others the entire field was almost entirely cut off. Grasshoppers have migrated into new districts and threaten to cause trouble next year.

During a trip through the western provinces in September, the Dairy and Cold Storage Commissioner, Mr. J. A. Ruddick, addressed the conferences of provincial officials and creamery men at Winnipeg, Regina, and Edmonton on the Grading of Dairy Produce.

Mr. G. H. Barr, Chief of the Dairy Division, acted as judge of dairy products at the exhibitions held in September at St. John, N.B., Shawville, P.Q., and Charlottetown P.E.I.

In view of the increasing recognition of the value of cold storage for the preservation and transportation of perishable articles of food, the International Institute of Cold Storage has arranged for the publication of a monthly Bulletin of Information in English and in French. There will be embodied in the Bulletin all the scientific, technical and economic documents of the world bearing on the subject. The publication aims at bringing quickly within easy reach of scien-

tists and manufacturers knowledge of the progress that is being made everywhere in cold storage. The International Institute Branch of the Department of Agriculture at Ottawa has the matter in hand for Canada.

NEW BRUNSWICK WOMEN'S INSTITUTES

The Short Courses in Household Science for 1921 held under the auspices of the Women's Institute Division of the Department of Agriculture were confined to the French speaking districts of the province, and were highly successful.

Classes in Cookery, Sewing, and Nursing, under the instruction of Miss Nutter, Miss LeBlanc, and Miss Landry, R.N., respectively, were held daily in five centres convenient to the women and girls of those districts. The attendance was especially gratifying.

At the conclusion of the Household Science classes, demonstrators were sent to each and every Institute in both the French and English speaking districts of the province.

The annual Summer School for Rural Improvement was held at Mcadonald College early in the month of August. The total number of students registered was 88, of whom 46 were resident in the province of Quebec and 37 in the province of Ontario. The course, which extended for a period of ten days, was held under the joint direction of Macdonald College and the Theological Colleges of Montreal, with the following speakers and topics: Rev. Professor W. A. Gifford,—Ten lectures on "The Social Principles of the Prophets and Jesus;" President Kenyon L. Batterfield,—Ten lectures on "A Rural Democracy"; Principal D. L. Ritchie, —Ten lectures on "Religious Education and Leadership"; Professor Sinclair Laird,— Two lectures, "The Church and the School," "Better Schools and Better Teachers"; Professor W. Lochhead,—Three lectures on Geology and four lectures on Genetics; Professor B. T. Dickson,—Four lectures on "Plants and Plant Life"; Dr. H. D. Brunt,— Four lectures on "Economic Problems."

THE NORTHWESTERN HORTICULTURISTS, ENTOMOLOGISTS AND PLANT PATHOLOGISTS

The fourth annual conference of the Northwestern Horticulturists, Entomologists and Plant Pathologists was held at Hood River, Oregon, in July last. This organization is international. The programme included a paper by E. W. White, Assistant Horticulturist of the province of British Columbia, on Apple Tree Anthracnose, or Black Spot Canker Control. In the election of officers William Downes, an official of the Entomological Branch of the Federal Department of Agriculture, stationed at Victoria, B.C., was elected vice-president of the association. The delegates to the conference included five members from the province of British Columbia.

CONFERENCE OF VETERINARIANS

The Minister of Agriculture for the Dominion, the Hon. S. F. Tolmie, has called a conference of veterinarians to meet in Ottawa on November 15 and 16 to discuss the best means for safeguarding the health of Canada's live stock. Representative veterinarians from every province in the Dominion have been invited to attend. Consideration will be given to the formation of a National Veterinary Association to work in conjunction with the Department in protecting Canadian herds and flocks.

While probably no country in the world has a better record than Canada as regards freedom from live-stock diseases, due largely to the inspection system of the Department's Health of Animals Branch, the enormous losses experienced by foreign countries make it imperative that extreme vigilance be exercised to guard against the introduction into Canada of such diseases, and the time is regarded as opportune for securing greater co-ordination of effort between practising veterinarians and officials of the Health of Animals Branch.

The Alberta Department of Agriculture recently opened an office for an Agricultural Representative at Lethbridge, appointing Mr. M. L. Freng to the position, with Mr. William Wilson as assistant. Mr. Freng was formerly farm manager at the School of Agriculture, Claresholm; then for two years he was manager of Mr. George A. Fuller's large Hereford farm at Girvin, Sask. From there he became principal of the new School of Agriculture and Farm at Gleichen. Mr. Freng is a capable and practical farmer, a good judge of live stock, and an efficient teacher in the class-room. Mr. William Wilson is a graduate of the University of Alberta in Agriculture and has done considerable judging at the district fairs of Alberta during the last three years, his specialty being beef cattle and sheep.

On September 15 an international conference was held at Sandusky, Ohio, to discuss the European Corn Borer situation. Fifty-two entomologists were present at this meeting, including Dr. E. D. Ball, Assistant Secretary of Agriculture of the United States; Mr. W. R. Walton, Mr. L. H. Worthley, Mr. D. J. Caffrey, of the Bureau of Entomology, Dr. W. A. Orton, and Dr. K. F.

Kellerman, of the United States Federal Horticultural Board, and entomologists from all the neighbouring States as far south as Mississippi. The Entomological Branch was represented by Messrs. Gibson, McLaine, and Crawford, and Professor Cæsar represented Ontario. Free discussion on the seriousness of the situation was held at the three sessions held. Through the courtesy of the State of Ohio, the Fish and Game Commission cutter took most of the delegates to Port Stanley, Ont., the following day. On the morning of the 17th the party was joined by Dr. J. H. Grisdale, Deputy Minister of Agriculture, by Mr. Spencer, of the Ontario Department, and by several members of the staff of the Entomological Branch. Some of the worst infested fields in the vicinity of St. Thomas were then visited by the party. At the closing session, held on Saturday afternoon, resolutions were passed by the convention dealing with the present situation and recommending a policy to be adopted in the future.

Hon. Manning Doherty, Minister of Agriculture for Ontario, has just announced the appointment of the Agricultural Development Board to administer the farm loan legislation passed at the last Session of the Ontario Legislature. The Board is made up as follows:—A. G. Farrow, Oakville, Chairman; W. Bert Roadhouse, Deputy Minister of Agriculture; T. R. Jennings, Assistant Auditor. It is expected that the Chairman will be the chief administrative officer in connection with this matter and the other two members, while retaining their present positions unchanged will merely act in an advisory capacity without remuneration. It will be noted that one has been selected from the Department of Agriculture and one from the Treasury Department, as both departments are concerned in this matter. Mr. Farrow, who will devote his whole time to this work, had considerable commercial experience before taking up farming at Oakville some seven or eight years ago. In his farming operations he specialized in pure-bred stock and has been most successful in winning some of the big prizes of the big exhibitions.

The Board will have charge of the administration of the legislation both with regard to short-term and long-term loans. Short-term loans, it will be recalled, are to be made through local Farm Loan Associations, and the function of the Board will be mainly to see that these Associations are properly organized and supervise their business. In the matter of long-term loans, however, the Board will make the loans direct after securing a valuation of the property on which first nortgage is to be taken and securing adequate evidence as to the character and reliability of the borrower.

With these appointments the Act will be in operation in the near future. It only remains to decide on a source of money for loaning purposes and the rate of interest. Whether the short-term associations are to be financed through the banks or direct by the Government opening branches and taking deposits has not yet been determined, but an announcement on these points will, no doubt, be made in a short time and steps taken to give immediate effect to the legislation.

APPOINTMENTS AND STAFF CHANGES

OBITUARY

On September 10, Mr. F. W. L. Sladen, Dominion Apiarist, died of heart failure while bathing at Duck Island, Lake Ontario, where he was engaged in carrying on bee-breeding experiments.

Mr. Sladen, who was a native of England, joined the Experimental Farms staff in 1912, and afterwards became Dominion Apiarist. He devoted a large share of attention to queen-rearing and bee-breeding.

In 1919 a mating station was established on Duck Island, and isolated mating became an accomplished fact. During 1920 and 1921 a large number of queens were reared at Ottawa and transferred to the island for mating with drones of special breeding. Excellent results were secured, and as an outcome, purely mated queens have been distributed to the Branch Farms and to beekeepers in different parts of the Dominion.

Other important phases of Mr. Sladen's work included a study of the Wild Bee and the Wasps of Canada, a study of the honey-producing plants from coast to coast, and the Wintering of Bees, a bulletin on which was published recently.

Mr. O. McConkey, B.S.A., has resigned his position as Agronomist at the Claresholm, Alberta, School of Agriculture, in order to take post graduate work in agronomy at the University of Illinois.

Mr. W. A. DeLong, B.S.A., has been appointed Assistant in Chemistry at the Nova Scotia Agricultural College. He takes the position formerly held by Mr. J. G. Archibald, B.S.A. Mr. DeLong is a graduate of the O.A.C., Guelph, Ontario. Previous to his present appointment he was employed by the Alberta Department of Agriculture as Instructor in Science at the Raymond Agricultural School.

Mr. H. S. Cunningham, B.S.A., Professor of Agriculture and Farm Mechanics at the Nova Scotia Agricultural College, has taken over the Drainage work formerly in charge of the late Mr. B. S. Landels, B.S.A. Since taking charge of this work Mr. Cunningham has been working on several large projects involving the drainage of several thousand acres.

Mr. R. J. Skelton, B.S.A., formerly of the staff of the Ontario Agricultural College, and late of the Soldier Settlement Board, has been appointed Field Enumerator in the Department of Poultry Husbandry of the University of British Columbia. For the present Mr. Skelton will be engaged in poultry farm survey work.

THE LIBRARY

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NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Report of the Minister of Agriculture for the Dominion of Canada, 1920-21.—Contains summary of the operations of the different branches of the department for the year under review.

Alkali Soils, their Nature and Reclamation. by Frank T. Shutt, M.A., D.Sc., Dominion Chemist.—Bulletin No. 4, Second Series, Central Experimental Farm.

Wintering Bees in Canada, by F. W. L. Sladen, Dominion Apiarist.—Bulletin No. 43, Second Series, Dominion Experimental Farms.

Report of the Dominion Cerealist, 1920-21, by C. E. Saunders, B.A., Ph.D., LL.D., Dominion Experimental Farms.

Report of the Dominion Horticulturist, 1920-21, by W. T. Macoun, Dominion Experimental Farms.

Experimental Farm, Brandon, Man., 1920-21.—Report of the Superintendent, W. C. McKillican, B.S.A.

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Alfalfa Growing in the Vancouver Island Districts, by L. Stevenson, B.S.A., M.S., Superintendent, Experimental Station for Vancouver Island. Circular No. 18, Dominion Experimental Farms.

Nut Culture in British Columbia, by Lionel Stevenson, M.S., Superintendent, Experimental Station, Sidney, B.C. Bulletin No. 49, Experimental Farms, Second Series.

Investigation of Potato Diseases, by Paul A. Murphy, B.A., A.R.C., Sc.I., of the Division of Botany. Bulletin No. 44, Dominion Experimental Farms, Second Series. Contains information that will be of use to the student and investigator, as well as the farmer.

Grande Prairie's Capabilities. Some Experimental Evidence, by W. D. Albright.—Pamphlet No. 29, Dominion Experimental Farms.

Mushroom Culture, by F. L. Drayton, Plant Pathologist.—Exhibition Circular No. 99, Dominion Experimental Farms.

Potato Growing in the Maritime Provinces, by R. D. L. Bligh, B.S.A.—Exhibition Circular No. 100, Dominion Experimental Farms.

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Dourine in Canada, 1904–1920—History, Research, and Suppression, by E. A. Watson, V.S., Chief Animal Pathologist Health of Animals Branch.

Simple Methods for the Storage of Ice.—Bulletin No. 57, Dairy and Cold Storage Branch.

The Control of Bark-Beetle Outbreaks in British Columbia, by Ralph Hopping. Circular No. 15, Entomological Branch.

The European Corn Borer.—Crop Protection Leaflet No. 13, Entomoligical Branch.

The Control of Grasshoppers.—Crop Protection Leaflet No. 14, Entomological Branch.

The Control of the European Corn Borer.—Crop Protection Leaflet No. 16, Entomological Branch, by H. G. Crawford, Entomologist, Division of Field Crop and Garden Insects, Ottawa, and J. G. Spencer, Department of Entomology, Ontario Agricultural College, Guelph.

The Canadian Record of Performance for Pure-bred Dairy Cattle, Report No. 13 for 1920-21.—Contains regulations, standards, and records of cows qualified for registration. Issued by the Live Stock Commissioner.

QUEBEC

The Rotation of Crops Explained.—Bulletin No. 70, Field Husbandry Division, Department of Agriculture.

Payment for Milk and Cream on the Basis of Butter Fat Content.—Bulletin No. 71 of the Department of Agriculture.

Competition of Agricultural Merit for 1920. Report of the judges, 1st Region. Issued as a supplement to the Report of the Minister of Agriculture of the Province.

Report of the Quebec Society for the Protection of Plants, 1920-21.—This report, which is issued as a supplement to the Report of the Minister of Agriculture for the Province, contains an account of the thirteenth annual meeting of the Society, held at Macdonald College in March, 1921, together with the papers and addresses delivered thereat.

ONTARIO

Report of the Horticultural Societies, 1920.—Contains report of the Fifteenth Annual Convention of the Ontario Horticultural Association held at Toronto in February, 1921.—Ontario Department of Agriculture.

BRITISH COLUMBIA

Annual Report of the Department of Agriculture, 1920.

MISCELLANEOUS

Live Stock and Animal Products Statistics, 1920.—Contains statistical data relating to Live Stock, Meat and Dairy Products, International Trade and Prices, prepared by the International Trade Branch of the Dominion Bureau of Statistics in collaboration with the Department of Agriculture.

Historical Statistical Survey of Education in Canada.—Issued by the Dominion Bureau of Statistics, Education Statistics Branch.

This report is intended to serve as an introduction to a series of annual statistical reports to be issued according to the plan approved by the Conference of Dominion and Provincial officials on Education Statistics held in October, 1920. The present report deals with the following topics in eight sub-divisions, as follows:

Part I contains a necessary explanation of the varying terminology employed in the several provinces in regard to education, and a summary of provincial educational legislation and practice. In Part II will be found a general summary of Canadian education statistics, attention being specially directed to Table 1, a statistical summary of Canadian education for 1919. Part III contains an analysis of the distribution of pupils by grade, sex and age, its statistics thus having an important bearing on the questions of acceleration, retardation and elimination of pupils. The statistics of teachers, their qualifications, experience,and salaries, are treated in Part IV. Statistics of the education of adolescents in secondary and technical schools are given in Part V, which also includes a treatment of the growing movement for consolidated schools. The cost of education in the publicly controlled elementary and secondary schools of Canada is given by provinces in Part VI. Part VII, after a short treatment of the movement for medical inspection, furnishes statistics of the education of the blind and of deaf-mutes, and Part VIII gives the statistics of higher education in Canada, an interesting feature being Table 117, which classifies the students in Canadian universities and colleges by their provinces of residence.

The Clydesdale Stud Book of Canada, 1921, Volume 29.—Compiled in the Office of the Canadian National Live Stock Records, Ottawa, and published by The Clydesdale Horse Association of Canada.

The Canadian Hereford Herd Book, Volume 12, 1921.—Contains pedigrees 38234 to 41227 inclusive. Compiled by the Office of The Canadian National Live Stock Records, Ottawa, and published by the Canadian Hereford Breeders' Association.

Holstein-Friesian Herd Book, Volume 24, 1921.—Contains the record of all pedigrees approved and admitted for registry since the publication of the previous volume. W. A. Clemons, Secretary, Holstein-Friesian Association of Canada.

Tree-Planting on the Prairies of Manitoba, Saskatchewan and Alberta, by Norman M. Ross, B.S.A., B.A.—Bulletin No. 1 (revised) of the Forestry Branch, Department of the Interior, Ottawa.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

GENERAL INFORMATION

710.—Economic Wealth of Alsace-Lorraine—*Comptes rendus de l'academie d'Agricalture de France*, Vol. VI, No. 14, pp. 354-360. Paris, April 14, 1920.

M. Meline presented to the academy M. Edmond Thery's book, *Richesses economiques de l'Alsace-Lorraine*, the chief object of which is to give a complete inventory of the resources of these departments. M. Thery lays a special stress on the wealth of the soil and subsoil of Alsace-Lorraine and sets forth the immense progress attained in agricultural production by the use of highly perfected methods of cultivation. He shows how from 1903-1912, the average yield had risen, for wheat from 27·5 bushels to 31·9 bushels per acre, for barley from 42 to 62·1 bushels, for oats 48·5 to 58·2 bushels, potatoes 206·6 to 237·4 bushels, alfalfa 2·8 to 3·4 tons.

To these general crops must be added special ones foremost among which comes that of the vine, which has placed Alsatian wines in the first rank; they have a flavour and bouquet equal to that of the best Rhenish wines. The Alsatian vineyards, in spite of the ravages of phylloxera, cover an area of about 64,220 acres, and produce some 180,000 hectolitres of wine.

To the cultivation of the vine must be added that of the hop, which covers some 9,880 acres, representing nearly 8 per cent of the world's production. The Alsatian hops are of first class quality. The cultivation of tobacco occupies about 9,000 planters and produces 92,080 cwts.

Breeding has made considerable progress in Alsace-Lorraine; from 1883 to 1912 it has steadily increased. During this period the number of cattle rose from 429,000 to 523,000 head, the number of pigs from 322,000 to 431,000, but that of horses alone remained stationary and sheep had decreased It is estimated that during this interval the value of the Alsatian herds had increased from $47,000,000 to $76,000,000 but this capital had been seriously encroached upon by the war.

The value of the forests has risen still higher. Inspector-General Lafosse estimates the value of the demesnial forests of Alsace-Lorraine at not less than $96,000,000, with an average value of $240 per acre, but these are the prices of 1917 and the present value of the forests would be more than $160,000,000.

The subsoil of Alsace-Lorraine is perhaps, considering its small area, the richest in the world for the importance and value of its deposits. The principal mineral is iron ore in the celebrated basin of Longwy-Briey, which enables France to add to the 18 million tons of ore from the basins of Briey and Longwy which she already possessed and 20 million metric tons from Lorraine and thus to become with the United States the richest country in the world as regards iron ore. The deposits of potash in Alsace are estimated to contain 250 million metric tons.

613.—The Nutritive Value of Yeast Protein .—Osborne, T. B., and Mendel, L. B., with the co-operation of Ferry, E. L., and Wakeman, A. J., in *The Journal of Biological Chemistry*, Vol. XXXVIII, No. 2, pp. 223-227. Baltimore, Md., June, 1919.

The idea of using yeast as a source of food protein for man and the higher animals is not new, although it has been given renewed emphasis through the war. It also presents the possibility of a synthetic production of protein from exceptionally simple compounds, and in addition, its use in supplying water-soluble vitamine was recently

demonstrated (*Journal of Biological Chemistry*, Vol. XXXI, p. 149, 1917: *American Journal of Physiology* Vol. XLV, p. 431, 1918). Although the statements on this point are not in uniform agreement, it has repeatedly been found that in the case of both adult men and animals, the utilization of the nitrogenous components of yeast, as judged by the coefficient of digestibility and by the nitrogen balance is good. Feeding experiments with growing animals with the most exaacting requirements for physiologically adequate protein are particularly useful for determining the utility nitrogenous nutrients. Apparently, there are no records of prolonged growth when yeast was the sole source of protein. Owing to this the authors kept rats for more than a year upon a diet in which yeast was the sole source of nitrogen as well as water-soluble vitamine. The results showed a nitrogen utilization in several cases of 74 to 83 per cent. The fact that animals can tolerate such large quantities of a food product so unique as yeast, obviously indicates that toxic substances must be excluded. In other experiments in which yeast was used solely as a source of water-soluble vitamine, the animals grew vigorously to adult size, but were sterile, with a very few exceptions, as the tests showed an absence of germ cells.

Other investigators have described similar conditions among animals fed on diets deficient in water-soluble vitamine.

615.—**The Distribution of Water-Soluble Vitamine.**—Osborne, T. B. and Mendel, L. B., with the co-operation of Ferry, E. L., and Wakeman, A. J., in the *Journal of Biological Chemistry*, Vol. XXXIX, No. 1, pp. 29-34. Baltimore, Md., August, 1919.

The water-soluble vitamine is widely distributed in ordinary food products and it is also present in cottonseed, millet seed, flaxseed, Kafir corn, hempseed, cabbage, alfalfa, clover, timothy, spinach, potato, carrot, and cocoaunt meal. To this list the authors added the onion bulb, turnip root, the leaves, stem and roots of the beet, and the tomato fruit.

It is also important to know the comparative value of the different natural foods with regard to water-soluble vitamine and nutrition, and the authors have conducted experiments with this in view.

To permit more accurate comparisons of the water-soluble vitamine content of natural foods, the procedure adopted consisted in feeding each day small, known quantities of the vegetable product under investigation, apart from the basal ration which was fed *ad lib.* In this way the effects of the different food substances could be compared, based on the water-soluble vitamine content. It was found that the samples of clover, alfalfa, and timothy hays used to furnish the water-soluble vitamine were much less efficient than the dried immature specimens. The fact that this difference exists, may have importance in feeding young animals and dairy cows. Consequently the authors advise that hay made from immature clover or alfalfa be used to replace a part at least of the milk fed to young stock, whilst the hay ordinarily given to dairy cattle should be replaced by that from less mature plants.

832.—**Horticultural Exhibition and Garden Competitions.**—Mulford, F. L. in *U. S. Department of Agriculture, Department Circular* No. 62, pp. 1-38, Washington, Oct., 1919.

The author who is associated with the Bureau of Plant Industry, United States Department of Agriculture, discusses horticultural exhibits from the following points of view: Organization; competitors; classification; various kinds of shows; arrangement of exhibits and methods of judging (score card method); prizes; rules (examples are quoted). The author concludes by a brief survey of garden competitions, and gives also an outline of the schedule system advised.

CROPS AND CULTIVATION

834.—**Cultivation does not Increase the Rainfall in the Great Plains States.**—Smith, J. W., in *Monthly Weather Review*, Vol. 47, No. 12, pp. 858-860. Washington, D.C., December, 1919.

It has been the general opinion amongst the farmers in the Great Plains States that the amount of land under cultivation influences the rainfall increase.

The author refutes this idea after taking note of numerous records.

The average precipitation in the northern Great Plains during the period 1868 to 1917 is recorded as follows:

1868–1877	19·8 in.
1878–1887	20·4 "
1888–1897	18·6 "
1898–1907	19·5 "
1908–1917	19·1 "

In the Central Great Plains:

1868–1877	16·3 in.
1878–1887	20·4 "
1888–1897	17·6 "
1898–1907	20·2 "
1909–1917	18·2 "

The data with reference to the southern and western States are analogous. There are well defined sequences of dry and wet years, but there has been no progressive increase or decrease.

496.—**Irrigation of Field Crops: Experiments in Nevada, U.S.A.**—KNIGHT, C. S., and HARDMAN, C., in Bulletin No. 96, *Agricultural Experiment Station, University of Nevada*, pp. 42, Carson City, Nevada 1919.

Discussion of the methods of irrigation used in Nevada; water supply and area irrigated by the State; factors affecting the results of irrigation water; description of experiments on irrigated field crops including alfalfa, wheat, potatoes, red clover and sugar beet.

In 1918, 900,000 acres or about 1·3 per cent of the area of Nevada was irrigated, and produced approximately some 145,000 acres of alfalfa 80,000 acres of wheat and 15,000 acres of potatoes. The chief rivers that supply irrigation water are the Humboldt, Truckee, Carson, Walker, and Muddy; the Humboldt waters over half the irrigated area.

Most of the alfalfa and cereals acreage is irrigated by flooding, while potatoes and other hoed crops are irrigated by means of irrigation furrows.

The chief factors that influence the effect of the irrigation water are the type of soil, its topography, the presence of a crust near the surface, the annual rainfall, and evaporation. The soil type causes more variation in the quantity of water required for irrigation than any other factor.

The average results of the experiments made with alfalfa during the period 1906-1911 show that with a total consumption of 3·27 acre feet of irrigation water, a yield of 5·93 tons of hay per acre is obtained. In the 5-year period 1914-1918, there was not sufficient rainfall during the growing period to influence the soil-moisture content of the soil. When irrigation was delayed until the alfalfa began to wither, the unit yield was relatively low; there was, however, a very high yield when irrigation was practised when the plants had only assumed a dark colour. The most economic irrigation for alfalfa was accomplished with a total irrigation of 3·5 feet of water, each time the plants showed need of water by turning dark green in colour.

Soil moisture determinations showed that, with an irrigation of 6 in of water 70 per cent of it was retained in the first 4 feet of soil; but with this, the lowest crop per unit volume of water consumed was obtained, or 6·18 tons of hay per acre for an 81 inch layer of water. Soil moisture determinations also showed that only 25 per cent of a layer of 12 inches of water was retained by a surface layer of soil 4 feet deep. In irrigated alfalfa fields, the decrease of the soil moisture content at mowing time was generally greater when 9 and 12 inches of water were given, while the total quantity of irrigation water retained in the soil was greatest at the time of the two last periods of wilting.

In experiments made with wheat during the 5-year period 1914-1918, 3 and 7 inches was given two or more of the typical growth periods, *i.e.*, appearance of the fifth leaf, ear formation, flowering, milky consistency of the grains, pasty consistency. The maximum yield was obtained with 28 inches of water in four applications, omitting that of the period when the fifth leaf appeared. The maximum yield with 3 irrigations was obtained with 21 inches of water, omitting the irrigations given during the first and last of the above-mentioned 5 periods. The average yields of wheat were considerably higher when 7 inches of water was given than with 3 inches at each irrigation. The yields were relatively low when the irrigations of the ear-formation and flowering periods were omitted, which shows a very critical period for wheat as regards its need for water, between ear formation and the period when the seeds are of a milky consistency. The highest yield was obtained by giving 9 inches of water in 2 irrigations, one before and one after earing. High unit yields were usually accompanied by the greatest decrease in the soil moisture content at harvest time compared with the soil moisture content before the first irrigation.

In the experiments with potatoes, continued during the 4-year period 1914-1917, the heaviest crop was obtained with a total irrigation of 16·5 inches of water, distributed in 3 inch applications when the plants showed a tendency to wilt.

Irrigation experiments with clover showed a gradual decrease in yield as the wilting period of the plants advanced at the time of irrigation.

Sugar beets gave the heaviest crop with 18-inches of water in 3-inch applications.

The results show, generally speaking, that the most economical use of water consisted in giving a total of 3·5 feet at the rate of 6 inches per time for alfalfa and clover; with a total of 2·3 feet in 3 inches a time for application for wheat with a total of 1·5 feet in 3-inch applications for potatoes and sugar beets. When alfalfa is used for autumn pasture after the last mowing, usually an extra irrigation is required after the last harvest.

626.—**Carbonication or Manuring with Carbon Dioxide.**—I. GERLACH, Kohlensauredungung, in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year XXXIV, No. 6, pp. 77-82. Berlin, 1919.—II. RIEDEL, F., Die Anwendung der Kohlensauredungung in grossen. *Ibid.*, Nos. 32-34-35, pp. 429, 451-455, 467-469.—III. *Ibid.*, in *Tonindustrie Zeitung*, Year XLIII pp. 607-619. Berlin, 1919.—IV. *Ibid*, Die Ausnutzung der Kochofenabgase

zur Kohlensauredungung, in Stahl und Eisen, Year XXXIX, pp. 1497-1508. Essen a.d. Ruhr, 1919.—V. Ibid Verfahren und Einrichtung zur Ausnutzung Kohlensaurehaltiger, unereiner Gase oder Abgase. (D.R.P. 316637, Kl. 806), in *Chemisches Zentralblatt*, Vol. I-II, No. 8, Techn. Teil., p. 334. Berlin, 1920.—VI. GEHRING, A., Dungung mit Kohlensaure, in *Umschau*, Year XXXIII, pp. 809-813, Berlin, 1919.—VII. BLOCK, B., Die Verwendung der Kalkofengase zur Kohlensauredungung, in *Duetsche Zuckerindustrie*, Year XCIV, pp. 399-401, Berlin, 1919.

I.—FISCHER, R. (*Gartenflora* pp. 298-1912) and others have previously demonstrated the possibility of increasing the yields of crops by augmenting the amount of carbon dioxide in the air. Gerlach, resuming these experiments at the Agricultural Institute at Bromberg, obtained on an average, in 1918 the following results (Table I), comparing crops in open field with crops in glass cases in small greenhouses with or without the introduction of carbon dioxide.

The extra yield in the open field may be attributed to cloudy weather, but the data for the lettuce are not reliable, as there was only a single plant in each pot. Nevertheless according to these experiments, a positive action of carbonication cannot be denied, but Gerlach asks if the results are sufficiently important to justify practical use without first waiting for further confirmation by later experiments.

II-VII.—Besides this, Riedel observed that out of 100 parts of organic plant tissue one-half is composed of carbon, in this way:

Although up till 1860 it was believed *ab antiquo* that plants were able to feed themselves organically, that is to say on carbon from the soil humus, Liebig's theory or carbon dioxide assimilation from the atmosphere was accepted, without however attributing any importance to the fact that the air contains barely 0·3 per cent of carbon dioxide and that the marked development of vegetation in the carboniferous period, which led to the formation of the coal measures now utilized by man, may be attributed to the larger quantity of carbon dioxide then present in the atmosphere. Taking this into consideration, Riedel worked out a method of applying carbon dioxide by utilizing gases produced by combustion rich in this compound. These gases are available in large quantities, especially in the metallurgical industry. With this in view the *Duetsch-Luxemburgische Bergewerks und Hutten* A. G. of Dortmund took up the author's proposition, and made an experimental apparatus. Thus, in the spring of 1917, 3 glass houses 19·68 feet wide by 81 feet long were constructed, and 2 of these were used for comparative experiments. Burnt and purified blast-furnace gas was introduced through a double set of perforated pipes running round one of the glass houses.

Percentage of dry matter of crops grown in open and also from plants grown under cover with addition of carbon-dioxide.

Crops	In open field	Under cover $+CO^2$
	%	%
Oats	+ 8	+15 to 20
White Mustard	+11	+18
Carrots	+25	− 4
Runner Beans	+60	+ 6
Blue Lupin	+35	+14
Tagetes	+19	+31
Phlox	+41	+47
Heliotrope	+ 8	+37
Lettuce	+50	−31

—	Water	Mineral content	Nitrogen	Hydrogen and oxygen	Carbon
	%	%	%	%	%
Potato tubers	75	1	0·3	12	11·7
Rye, seed	13·4	2	1·8	41·8	41·0

The other, on the contrary, better exposed, received no carbon dioxide. The addition of carbon dioxide apparently produced a surplus yield equal to 2½ times the control in the case of tomatoes, and to 1·7 times in the case of cucumbers. Riedel also arranged a scheme for the treatment of plants in the open with carbon dioxide. For this purpose, he set out square plots surrounded by perforated cement pipes, through which the residual blast-furnace gas was passed; at the same time an untreated field with a similar sandy loam soil served as a control. The results obtained with crops treated with carbon dioxide were as follows:

Spinach 2·5	times the yield of the control plot		
Beets 1·5	"	"	"
Potatoes 2·8	"	"	"
Lupins—			
green 2·74	"	"	"
dry 2·9	"	"	"
Barley 2·0	"	"	"

In 1918, the work was extended and the same interesting results were obtained; the surplus yield due to the carbon dioxide treatment was 2-3 times for the tomatoes under glass; in the open field, potatoes treated

in a similar manner gave a yield 4 times as high and beets gave the following results:

—	With CO^2	Without CO^2	Ratio
	kg.	kg.	
Plot of 1 sq. metre area + manure + fertilizer one application	2·8	3·9	1:1·40
Plot of 1 sq. m. area + manure + fertilizer, double application	3·3	5·1	1:1·54
Ratio	1:1·18	1:1·30	

It appears from this that the addition of carbon dioxide would prove useful also to the other manuring of the soil.

To complete these experiments, the treated air was analyzed in order to determine the amount of carbon dioxide absorbed in glass houses containing tomatoes and in others that were not cultivated. In the first case, after stopping the inflow of carbon dioxide, the content fell to 0·1 to 0·2 per cent, and in the second case, 0·42 to 0·65 per cent, compared with 1 per cent at the start.

According to Riedel, these tests give a positive answer to the question raised by Gerlach namely that the addition of carbon dioxide contributes to a marked extent towards plant development, because the ordinary content of carbon dioxide in the atmosphere does not constitute an optimum. The unsuccessful results should be attributed to unfavourable experimental conditions or to other exceptional causes.

Another question must be asked: Can sufficient quantities of carbon dioxide at a reasonable price be obtained for fertilizing purposes? With the hope that this problem may be successfully solved, the future of agriculture assumes a bright aspect. It is obvious that compressed carbon dioxide can not be employed as in previous experiments for this purpose except in case of absolute necessity, as such a method is too expensive and inadvisable. Quite apart from the possibility of considerably reducing the consumption of carbon dioxide, there are sufficient sources from whence the gas can be obtained cheaply.

Without taking into account the many combustion gases which require special treatment for the elimination of harmful ingredients, blast-furnace gases constitute a convenient source of carbon dioxide. These gases contain, it is true, carbon monoxide, but, at normal concentration, it is not injurious to plants, and it is in the interests of heating economy to reduce the content as much as possible.

Other harmful constituents of blast-furnace gases are usually eliminated in most plants, in order to avoid injury to the aparatus. In several cases, the gases still contain sufficient heat to warm glass houses to a large extent. The exhaust gas from gas engines should be especially useful, as it is under pressure, and therefore does not require machinery to distribute it, particularly if it has to travel several kilometres; a network of piping will be sufficient. As regards the amount of blast furnace gas available, it must be remembered that a furnace charged with 100 tons of coke burns 85 tons of carbon, capable of producing 320 tons of vegetable matter such as potatoes. In Germany, before the war, the siderurgical works used 4,000 tons of coke daily in the blast furnaces, and produced 35 million cubic metres of gas with 20 per cent of carbon dioxide per day. The lime kilns, as well as sugar refineries could also supply carbon dioxide.

The time will come, according to Riedel, when there will be special installations for supplying carbon dioxide for agricultural purposes, just as there are now special plants for the distribution of electric power. This possibility depends on a question of development which cannot be settled in a moment, but which will no doubt be cleared up when conditions are more favourable. Although it is possible that Germany may be able to obtain sufficient industrial carbon dioxide to give increased yields capable of covering the deficit in agricultural crops, until the time when this can be realized, great importance should be attached to organic manures as a source of carbon dioxide for plants. Considering that an increase in the foliar surface necessitates a greater absorption of carbon dioxide, all organic residue matter available should be collected in order to help in the formation of mould.

In conclusion, Riedel quotes the opinion of a German Horticultural Inspector, to the effect that the use of carbon dioxide as manure can hardly be neglected, as it constitutes, like nitrogen, phosphates and potash, an important factor in plant nourishment.(1)

497.—**The Preservation of Liquid Manure.** KRISTENSEN, R., K., in the *Tidschrift for Planteavl*, Vol. XXVI, Pt. 3, pp. 485-490. Copenhagen, 1919.

The Danish State Agricultural Experiment Station at Askov has carried out experi-

(1) In the United States, Cummings, M.B. and Jones, C. H. (*Journal of the Chemical Society*, Vols. 117-118, No. 689, Pt. I, p. 267. March, 1920), in carrying out experiments with a current of carbon dioxide under glass (boxes or frames) have obtained favourable results with peas, potatoes, strawberries, and lettuce, but not with radishes, which, however, matured early. In most cases, the plants grown with carbon dioxide showed a higher carbohydrate content and a lower protein content. Lettuce benefitted the most when given 300 litres of carbon ploxide per day in boxes 130×70×30 cm. (Ed.).

ments on the preservation of liquid manure by adding sulphuric acid or superphosphate.

The liquid manure used contained 0·478 per cent of nitrogen, of which 0·418 per cent was present as ammonia. It was placed in porcelain dishes and evaporated on a water-bath; a series of 5 cc. samples was treated with from 0 to 32·5 cc. of decinormal sulphuric acid and with 0·1 to 1·5–gm. of 18 per cent superphosphate.

The results obtained showed that two-thirds of the acid used was retained by the ammonia, and the rest by the other bases. Very small quantities of acid had practically no effect on the conservation of the ammonia; in order to fix all that contained in the 5 cc. sample, 1·3 gm. of superphosphate or 22·5 cc. of decinormal sulphuric acid was required.

498.—**Experiments and Researches on "Tetraphosphate".**—MENOZZI, A., in the *Giornale di Chimica Industriale*, Year II, No. I, pp. 8-9. Milan, January, 1920.

Some four years ago, a product called "tetraphosphate", made and marketed by a company bearing the same name, gave rise to a large number of publications and to much discussion. Publications in its favour upheld and still uphold that it has the same fertilizing value as superphosphate, but without the acidity of that product which is so injurious to certain soils and harmful to the bags, and that it provides phosphoric acid at a cheaper rate than superphosphate. After detailed discussion the article concludes: The yields obtained in 1917-18 show that:— phosphorite and tetraphosphate always produced a little more than the control with phosphatic fertilizer; that both were always inferior to superphosphate; that there were only slight differences between phosphorite and tetraphosphate, and these mostly came within the limits of experimental error.

722.—**Sulphuric Acid and Fertilizers.**—BAUMANN, in the *Chemiker Zeitung*, Year XLIV, No. 55, pp. 346-347. Kothen, May 6, 1920.

The present scarcity of the raw materials required by the chemical industry naturally gives rise to restrictive measures, so that the riches of the soil have to be used with more foresight now than before the war. A typical example of this is afforded by the sulphur and pyrites employed in the manufacture of sulphuric acid. The author has devoted his attention to the use of sulphuric acid in the production of the two main classes of chemical products, viz., phosphatic, and nitrogenous compounds. On the occasion of the celebration of the 25th Anniversary of the Union of German Fertilizer Manufacturers, on Jan. 26, 1905, attention had already been called to the great problem, still unsolved, of the fertilizer industry and the dry treatment of phosphates without acids with a view to rendering them more available. Although the full economic importance of the question was not then realized, nevertheless experiments were undertaken for the purpose of partially or wholly eliminating the use of sulphuric acid in the phosphatic fertilizer industry.

From the statistics on fertilizers published by the *International Institute of Agriculture*, it is possible to calculate the pre-war consumption of sulphuric acid in the production of the above-mentioned class of fertilizers as follows:—

	Metric tons
World production of sulphuric acid	5,000,000
European production of sulphuric acid	3,700,000
World production of superphosphate	7,500,000
Corresponding world consumption of sulphuric acid	3,000,000
European production of superphosphate	5,600,000
Corresponding European consumption of sulphuric acid	2,240,000
World production of sulphate of ammonia	1,057,000
Corresponding world consumption of sulphuric acid	793,000
European production of sulphate of ammonia	941,000
Corresponding European consumption of sulphuric acid	710,000
Percentage of the world production of sulphuric acid used for superphosphate	60%
Idem of the European consumption	65%
Idem of the world production used for sulphate of ammonia	16%
Idem of the European production	19%

These figures show that ¾ of the world production of sulphuric acid is completely lost in the soil, when either superphosphate or sulphate of ammonia are used, and at the present moment, we have no right to waste such an enormous quantity of sulphuric acid.

844.—**New Types of Basic Slag for Sale in the British Isles.**—The Rothamsted Experiment Station in *The Journal of the Board of Agriculture*, Vol. XXVI, No. 8, pp. 829-830, London, 1919.

There are distinct types of basic slag on sale in the British Isles which must on no account be confused.

I. Bessemer slag, containing phosphoric acid equivalent to 40 per cent or more of tricalcic phosphate, largely soluble in 2 per cent citric acid: usually 80 per cent of the total is guaranteed soluble.

2. Basic "open hearth", containing less phosphoric acid, equivalent to 15 to 31 per cent of tricalcic phosphate, largely soluble (80 per cent) in a 2 per cent citric acid, the first pourings being richer than the last.

3. *Idem*, made by the use of lime and fluorspar, containing as much phosphate as the poor grades of the preceding class, but only slightly soluble (20 per cent or less) in 2 per cent citric acid.

The first of these 3 types, the Bessemer slag, is the fertilizer which for many years was well known to farmers as one of the most effective fertilizers for pasture land. The second and third types have come into prominence in recent years, especially during the war, as a result of changes in the method of making steel. At first sight these two new types do not appear very promising agriculturally, but field experiments have shown that they possess distinct value. Experiments conducted in 4 counties by 4 different experimentors demonstrated that the second type has proved substantially equal in fertilizer value to the old Bessemer slags, when compared on equal phosphate content. The third type proved more effective than was at first assumed from their low solubility in citric acid (2 per cent). When the growing season has been sufficiently long, these slags have proved approximately as useful as the others, in spite of their low solubility.

With reference to the question as to whether the poor slags are worth as high a price as the rich, although it cannot be denied that the value of slag lies in other constituents apart from phosphates, it is safest however in accordance with present knowledge to adopt the plan of judging the new slags on their phosphatic content, that is to say, according to the unit system, and the degree of fineness. Having allowed for this, there is probably no justification for paying more for the 40 per cent slag than for the others.

729.—**Formaldehyde Treatment of Maize Seed.**—Richey, F. D., in the *Journal of the American Society of Agronomy*, Vol. XII, No. 1, pp. 39-43. Washington, D.C., Jan., 1920.

The author observed the effect on the germination of maize seed, of treatment with formaldehyde solutions of different strengths and for different periods, with a view to preventing the growth of fungi on seedlings grown in water cultures. Samples were tested for germination, both in water cultures and in sand. Treatment of maize with solutions of 5, 15 and 25 cc. of formaldehyde per litre materially reduced the development of the seedlings grown in water culture. The vitality of the seed, as evidenced by the development of the seedlings in either water culture or sand, was not affected by treatment with a solution of 5 cc. of formaldehyde per litre. Treatment with the solution of 15 cc. of formaldehyde per litre did not materially affect the seedlings grown in water culture, but nevertheless was injurious to germination and development in sand. Treatment with 25 cc. per litre was markedly injurious. Soaking maize for 2 hours in a solution of 5 cc. formaldehyde in 995 cc. of water, followed by a fumigation period from 2 to 24 hours in length, can therefore be recommended for checking the development of fungi, without interfering with the normal development of seedlings in water cultures.

741.—**Topping of Wheat Liable to Lodging.**—I. Schribaux, II. Bachelier, in *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 14, pp. 360-365. Paris, April 14, 1920.

I.—M. Schribaux describes a definite means, not only of dealing with lodging, but for utilizing the vigour of growth of wheat to increase the grain yield at the expense of the straw yield.

When the wheat shows signs of bearing and measures about 12 inches, it is sufficient to cut back to 6 inches, *i.e.*, to half its normal height. When the plant again reaches a height of 8 inches, it is advisable to cut back a second time to 6 inches if it still appears liable to lodging; this second treatment is hardly ever necessary. By this means, the entire wheat crop is rendered resistant to lodging, whatever the height, and 12 and 6 inches are the recognized figures which it is wise to observe as nearly as possible. If the wheat obviously exceeded 8 inches in height, one must take the risk of topping, anyhow to a small extent, the young ears, which are still enclosed in the sheath.

The practice of topping, first pointed out by M. Hanicotte, farmer and former President of the Syndicate of Agricultural Distillers in the North, is at the present time a generally recognized procedure on the best farms in the north of France. On small areas, the wheat is cut with the scythe or sickle; in the neighbourhood of Paris, a header is employed, which is a kind of very light sickle with a blade which can be lifted to at least 6 inches. This same implement, manufactured by Garnier, at Mormant (Seine-et-Marne), is also used for destroying weeds amongst the wheat.

Topping delays ripening for some days and somewhat reduces the straw yield, but, on the other hand, the quantity and

quality of the grain yield is improved. A field thus treated gave the lowest proportion of dwarfed wheat. The cause is easily explicable; the topping which can be compared to the pinching practised by gardeners has the effect of equalizing the development of the tillers. The more advanced are retarded in growth to the advantage of the smaller ones, not reached with the sickle; the latter which would have only given small tiller growths, take the same time to mature as the older ones.

In order to show the various advantages of topping, M. Schribaux gives a brief *resumé* of a paper read some time ago (1909) before the National Agricultural Society, by M. Bachelier. M. Bachelier had cut back wheat covering an area of 61·75 acres sown after alfalfa, leaving a control plot of 32·8 feet untouched for comparison purposes. In the area treated, M. Bachelier obtained an increased yield of 1,400 lbs. of grain and a decreased yield of 1,540 lbs. of straw per acre.

What expenses are entailed by this operation? The machine used cost $90 (pre-war prices). The cost of upkeep is negligible, as the blade is held too far away from the soil to encounter obstacles. An area of 9·8 acres can be covered in a day by a man and a horse. This expense, plus the value of at least 13·7 cwt. of hay, is largely compensated for by the decrease in the cost of harvesting and the superior quality of the produce.

The idea of topping is almost as old as the cultivation of wheat, but M. Hanicotte has the merit of having perfected it.

This method is equally successful with oats but the operation is not so easy as with wheat. As oats grow very quickly, the time allowed for performing this operation is very limited. By delaying the treatment there is a risk of letting the plant get too tall, and of injuring the panicle, still enclosed in the sheath, and consequently of damaging the production of grain.

II. M. Bachelier considers that there is no reason to fear that, even in case of drought, topping will damage the crop yield.

In order to apply this process to hardy wheats, it is absolutely necessary to choose the right moment when the upper part of the leaves can be clipped without touching the stalk. The whole success of the operation depends on this precaution.

With the Garnier, it is possible to cut back 9·8 acres per day. The machine consists of a kind of shears with a detachable blade which can be regulated to the height of the wheat. This blade is lighter than that of a mower. It is necessary to work quickly, as the period when it is possible to cut back wheat is very limited. Topping slightly reduces the height of the stalks and makes the plant resistant to lodging.

751.—**Food and Fodder Plants.**—HOLLAND, J. H., in the *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, Nos. 1 and 2, pp. 1-84. London, 1919.

Description of the most important food and fodder plants included in the Natural Orders: *Leguminosæ*, *Gramineæ Cruciferæ*, and *Rosaceæ*, etc.

For each plant the author gives the chief countries of production, imports into the United Kingdom, the approximate production of some of the principal crops in the United Kingdom, brief details as to uses, and other notes of practical interest.(1)

633.—**Studies in the Pollination of Indian Crops, and the Possibility of Improvement by Selection.**—HOWARD, A., HOWARD G., and ABDUR RAHMAN KHAN, in *Memoirs of the Department of Agriculture in India*, Vol. X, No. 5, pp. 195-220. Calcutta, Dec., 1919.

635.—**"Pusa No. 4", Indian Wheat Variety Imported into France Because of its Early Maturity and Resistance to Scorching.**—SEVERIN, R., in *Comptes rendus des seances de l'Academie d'Agriculture de France*, Vol. VI, No. 12, pp. 313 and 324-325. Paris, March, 1920.

The author presented to the Academy some ears of the Pusa No. 4 wheat variety selected by Prof. Howard of the Cereal Station of the University of Pusa. This wheat has the characteristics of rapid growth and of carrying its grain normally until mature, even if sown very late after the last rains, or if there is no rainfall from sowing time until harvest. This was proved at Vaucluse by M. Brulat, in spite of a persistent northwest wind after the sowing at the end of March, followed by an exceptional drought during the summer of 1919; also at Toulouse by Prof. Rives, at the University Agricultural Institute, and at Bagnols-sur Garonne, by M. Rouart (sown on April 5), and also on the author's own trial plots at Clos-l'Arat, Fontet, near Reole (Gironde). The ears taken from these cultures were ripe in 90 days.

Several other varieties of Indian wheat with a rather less fine grain sown in the spring of 1919, escaped the rust which ruined the autumn sown varieties in 1918, and gave results which the author hopes to confirm this year. The author is also testing further samples from the Experiment Stations in

(1) The International Institute Library has these Bulletins of the Kew Gardens, and they will be loaned to anyone desiring them (Ed.).

Australia and the United States, bearing in mind the fact that the Indian wheats are particularly resistant to drought, and excess of moisture, and are thus valuable for improving wheats in countries that suffer from excessive heat and dryness.

513.—**Improvement of Sugar Beet by Selection, in France.**—Gaillot, M., in *Comptes rendus des Seances de l'Academie l'Agriculture de France*, Vol. V. No. 39, pp. 986-995. Paris, Dec., 1919.

529.—**Action of Heat on Sugar-Beet Seed.**—Saillard, E., in *Comptes rendus des Seances de l'Academie d'Agriculture de France*, Vol. VI, No. II, pp. 308-311, Paris, March 17, 1920.

535.—**Planting Trees on Waste Heaps, Abandoned Quarries and Land in Belgium.**—Crahay, N. I., in the *Bulletin de la Societe Centrale Forestiere de Belgique*, Year XXVII, No. 3, pp. 117-131. Brussels, March, 1920.

536.—**The Eco-Dendrological Problem of the Production of Forest Seeds.**—Borghe Sani, G., in *Rivista de Biologia*, Vol. I, Pt. 5-6, pp. 559-585. Bibliography of 63 publications. Rome, 1919.

LIVE STOCK AND BREEDING

897.—**An Experiment with Fattening Pigs to Compare Cooked with Raw Potatoes.**—*Department of Agriculture and Technical Instruction for Ireland Journal*, Vol. XX, No. 2, pp. 190-193. Dublin, 1920.

The high cost of fuel, of manual labour, etc., has been the reason why many farmers hesitate to undertake the fattening of pigs with cooked food, especially potatoes, which, however, is a customary proceeding in Ireland. The Department of Agriculture has therefore undertaken a series of tests in order to ascertain if it is possible to fatten pigs successfully on a diet of raw potatoes. These tests were carried out at five centres, and at each centre the pigs were divided into 2 lots, as far as possible homologous in appearance, and the total number of pigs was 34. The average age of the pigs at the commencement of the tests was 15 weeks and the tests covered a period of 110 days.

Lot 1 was given cooked potatoes; Lot 2 raw pulped potatoes. In all other respects the two lots were treated alike. The two lots consumed the same quantity of feed.

Results show that the 17 pigs which received cooked potatoes made an increased gain in live weight of almost 16 lbs. per head (equals a total gain of 266 lbs.) as compared with the 17 pigs which received raw potatoes. Naturally, against the pigs which were fed on cooked potatoes must be set the cost incurred in cooking the latter. Nevertheless, taking into account the market conditions when the experiment was made, the value of the increased live weight was obviously superior to the expenses incurred in cooking the potatoes, and the following conclusions may be drawn:

(1) At the present price of pork a substantial profit is obtained by the cooking of potatoes for fattening pigs.

(2) Moderately good results may be obtained from the use of raw potatoes; but in this case the fattening period is extended.

781.—**The Pigeon as a Means of Increasing the Food Supply.**—Benedetti, I., in the *Giornale degli Allevatori*, Year XVI, No. 14, p. 108. Catania, May 20, 1920.

The author recommends pigeon-rearing for the rapid production of meat. The ordinary breed of pigeons should be chosen, for it is the most profitable, as from 20 to 24 young are produced annually.

Taking his own experiences in pigeon-breeding as a basis he calculates the profits of one financial year as follows:

Installation.—In order to set up a small pigeon-breeding establishment, it is necessary to have 100 pigeons ready for breeding; 50 suitable breeding boxes; 100 glazed earthenware nests; 4 zinc syphon drinking troughs; 8 special feeding-boxes to prevent the food being scattered or soiled; boxes for ashes, rubbish, straw, etc., other objects such as perches, apparatus for disinfection, small ladders, etc.; the transformation of a room with an area of 16 x 13 feet and 11 feet, 6 inches in height, including the external cage into a pigeon loft; labour for putting in the boxes; other expenses.

FARM ENGINEERING

859.—**A Turbine Sorter for Seeds.**—I. Ringelmann, Selection des bles au trieur, *Comptes rendus de l'Academie d'Agriculture*, Vol. VI, No. 19, pp. 477-478. Paris, May, 1920.—II. Zacharewicz, Ed., *Ibid*, pp. 489-491.

M. Ringelmann reports the opinion of the Rural Engineering Section as regards M. Zacharewicz's suggestion of using a turbine sorter for seed-wheat.

The ordinary sorter divides the seeds according to their length and width, but without any regard to their weight, which is a third very important character in wheat used for sowing.

The Marot turbine sorter allows of bad, light grains being separated from good seeds, which are of the same size.

The so-called air-turbine, or turbine fan, can be affixed to all sorters, and has nothing to do with the small fans or winnowing machines, that merely remove the dust, husks, and chaff.

The results obtained by M. Zacharewicz with Manitoba wheat are given below:

—	Weight per bushel	Proportion
	lbs.	
Before sorting	62·4	100·00
Sorted with ordinary sorter (without turbine)	63·6	101·92
Sorted with turbine-sorter	64·0	102·56

The ordinary sorter gives an increase of weight, per unit of volume, of 1·92 per cent with grain that has not yet been passed through the machine; the increase in weight due to the action of the turbine is slight (0·64 per cent).

In some experiments with the Marot honey-comb sorter, M. Zacharewicz obtained the following results, after adjusting the apparatus in such a way as to obtain the best work.

In these experiments, carried out without a turbine, and with an agricultural type of sorter, the increase in weight per unit of volume of the seed-wheat due to sorting varied from 1·3 to 5·3 per cent according to the original weight of the grain.

—	Weight of bushel		Proportion	
	Before sorting	Seed wheat	Before sorting	Seed wheat
	lbs.	lbs.		
Local wheat (Deux Sevres): 1st lot	59·7	62·9	100	105·3
Local wheat (Deux Sevres): 2nd lot	60·8	61·6	100	101·3
Saumur March wheat (sold for seed)	60·8	64·0	100	105·2

688.—**French Types of Farm Buildings.**—DABAT, L., Report presented on behalf of the Agricultural Committee, on the collaboration of MM. Vignerot and Maitrot in the publication of the "Modeles-types de Constructions Agricoles" of the Ministry of Agriculture, in the *Bulletin de la Societe d'Encouragement pour l'Industrie Nationale*, Year CXIX, No. 1, pp. 21-24. Paris, Jan.–Feb., 1920.

The French Ministry of Agriculture has published a work entitled "Modeles-types de Constructions Agricoles" with the object of assisting both farmer and builder in the improvement of rural buildings. The types dealt with result from work carried out in various parts of France by the engineers of the "Corps des Ameliorations agricoles" (which has since become the "Corps du Genie rural") who, by their constant contact with the rural populations, have been able accurately to gauge local needs. The types also take into account the data furnished by projects that gained prizes in competitions opened by the "Service des Ameliorations agricoles" for architects and builders who have specialized in rural buildings.

In deciding on these model types, recourse has been had continuously both to the most recent and practical information furnished by agricultural science and by hygiene, and to the results acquired by experience. The science and experience have been directed not towards the elaboration of entirely new models, but towards the improvement of regional types studied on the spot with their local characteristics derived from the soil, climate, customs, and economic life of each region.

The result is that these regional model types of agricultural buildings represent a combination of the precepts of treatises on agricultural buildings with a monographic documentation and model projects of a concrete character. They are applicable to the most varied kinds of buildings:—Farms, barns, stables, cattle sheds, sheep-folds, houses for farmers and of labourers, co-operative works, etc. Each model type includes an introduction explaining and justifying any general or particular arrangements adopted, as well as the economics of the scheme, general and detailed plans, specifications for the work, a detailed estimate of the cost, a memorandum of such regional prices as could be ascertained easily, and a list of charges and conditions for the undertaking.

Farmers who wish to build or restore farm buildings will find in the work in question all information necessary for choosing the arrangements that are best and most suited to their particular region. Builders, architects, contractors, local workmen will be able to find the characteristics of all types of agricultural buildings as well as the basis for any special work they have to carry out.

The work is published in two forms:—(1) The work, text and plates, is bound in a royal-quarto album for each part; (2) each project separately with large plates. The complete work comprises 4 parts including 80 model types from all the regions of France; a fifth part will be published later dealing with co-operative factories for dairying, cheese and butter making, distilling, oil extraction and cider making and with co-

operative warehouses, etc. The work was ready for publication, but the advent of the war delayed it so that preparations for publication could only be begun in 1916.

The first two parts, corresponding with the North and East regions of France, have already appeared and will be of great assistance to those who have the heavy task of reconstructing the villages destroyed during the war. A considerable number of these model types of agricultural buildings has been distributed in the devastated agricultural regions by the Ministry for the Liberated Areas, and agricultural societies and other associations interested in the renaissance and development of agriculture in these regions have been supplied with the documents, which are kept by architects and contractors. In this way, the devastated regions in the North and East of France will be the first to benefit from this interesting and original work of the Ministry of Agriculture and, eventually, the other regions will be able to begin the work of improving rural buildings on sound and methodical lines, whilst avoiding the equally bad extremes of superfluous luxury and misguided economy.

The work of preparing and supervising the publication of the model types of farm buildings was confided in 1916 to M. Vignerot, a technical official of the Ministry of the Liberated Areas, who edited the whole work and gave homogenity to the varied contributions from his colleagues. As M. Vignerot was sent abroad on a mission in 1918, the work was then placed under the direction of M. Maitrot, who succeeded to M Vignerot's position in the Ministry. M. Maitrot has mainly been occupied on the diffusion of the model types in the devastated regions, particularly amongst the 1534 co-operative building societies that have been established.

RURAL ECONOMICS

788.—The Value of Fruit Trees.—I. DELAUNY L., in *La Vie a la Compagne*, Vol. XVI, No. 194, p. 181. Paris, August, 1920.—II BRETON-BONNARD, L., in *Le Jardin* Year XXXIII, No. 720, p. 360, Paris September 20, 1919.—III. LECOLIER P., in *La Vie Agricole et Rurale*, Year IX. No. 47, pp. 384-386. Paris, November 22, 1919.

AGRICULTURAL INDUSTRIES

796.—The Use of Milk Powder in Bread-Making.—LINDET, L., in *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 18, pp. 465-467. Paris, May 12, 1920.

M. Lindet exhibited milk bread made with desiccated skim-milk. This bread has a good flavour, and rises very satisfactorily, even when the quality of the flour used leaves much to be desired. The skim-milk powder absorbs as much water as the flour, and this may be replaced, weight by weight, by the milk powder. If 10, 15 or 20 per cent of the latter is added, and the consumer eats the same amount of bread, a saving of 10, 15 or 20 per cent of the flour is effected.

In flours, the proportion of the carbohydrates (starch, sugars, etc.) to the nitrogenous substances is as 100 is to 17 or 18; in skim-milk, the proportion of lactose to casein is as 100 is to 70. In wheat bread with the present flours extracted at 80 per cent, there is from 8 to 9 per cent of nitrogenous substances, while in a bread containing 15 per cent of milk powder, there will be from 15 to 16 per cent.

At the present time, milk powder costs 4·20 fr. per kg. but as milk bread is a luxury article, it finds consumers, even at a high price.

It might be objected that skim milk itself could be used, instead of the milk powder, which would avoid the need for evaporation, This might be done, if the dairy were near the bakery, but skim-milk soon turns acid. It is true that it might be pasteurized or sterilized, but the coal used in these operations and the transport of the water contained in skim-milk, would cost more than the coal needed for desiccating the milk.

In short, M. Lindet believes that the manufacture of milk bread might be encouraged without detriment to the general food supply, and that its use would economize the flour supply. However, he draws attention to the fact that such bread is an article of luxury, and superfluous from the point of strict necessity.

PLANT DISEASES

912.—The Destruction of the Elm by Poison-Gases in War.—GRAFFIN, R., in *Comptes rendus des seances de l'Academie d'Agriculture de France*, Vol. VI, No. 24, p. 609. Paris, 1920.

The elm has proved extraordinarily susceptible to the injurious effects of poison-gases, more so indeed, than any other forest tree.

In the *massif* of the Argonne chain running from the Valley of the Bar to the Meuse (Vouziers to Senay), there are many dead elms that show no trace of having been struck by missiles, or otherwise injured.

Elms are equally susceptible whether they are growing singly or in a coppice and their age makes no difference.

If a dead tree is found there today in a stand, the probabilities are that it will prove to be an elm, although this corner of Argonne was not bombarded until November, 1918,

The Institute Branch is endeavouring to secure a copy of these publications (Editor's note).

and then only for a short time at the season when the trees had shed their leaves.

601.—New Studies on Sorosporella Uvella, a Fungoid Parasite of Noctuidæ in America.—SPEARE, A. T., in *Journal of of Agricultural Research*, Vol. XVIII, No. 8 pp. 399-439. Washington, D.C., Jan. 15, 1920.

Observations mainly of a biological nature on *Sorosporella uvella* (Krauss). Gd., a fungus recorded from the eastern United States and from Canada as a parasite of various species of Noctuidæ. The observations are based on the study of artificial cultures of the fungus, on inoculation experiments on various living hosts, and on the histological study of infected insects before and after death.

It is now admitted that the fungus in question should be classed not with the *Entomophthorales*, but with the verticillate Hyphomycetes until its perfect or ascigerous stage is discovered. In fact, the development and structure of the conidiophores of *S. uvella*, and the formation of the conidia are characteristic of the latter group of fungi.

The fructifications of the parasite in question consist of thick-walled resting spores or chlamydospores and thin-walled conidia: the latter have now for the first time been definitely connected with the life cycle of the fungus.

It has been shown that the special, saccharomycetiform vegetative cells present in the blood of infected insects are ontogenetically connected with other phases in the cycle of the fungus. These cells are ingested by some of the white blood-corpuscles (phagocytosis) and this is apparently followed by the destruction of the phagocytes. This phenomenon has been overlooked by those who have studied the fungoid diseases of insects.

The fungus grows quickly on artificial media and shows two entirely different types of development when cultivated on the appropriate medium. In certain cases, whether the fungus is cultivated on artificial media, or whether the chlamydospores are put in damp cells, fruiting structures of the *Isaria* type are produced.

The disease caused by *S. uvella* is rapidly transmitted to healthy insects; in laboratory experiments a mortality varying between 60 and 90 per cent can soon be obtained.

913.—Bacterium Atrofaciens N. Sp., Injurious to Wheat in the United States and in Canada.—MCCULLOCH L., in *Journal of Agricultural Research*, Vol. XVIII, No. 10, pp. 543-552, Washington, D.C., Feb. 16, 1920.

In the course of examination of various collections of wheat of the crops in 1917 and in 1918, a new bacterial wheat disease was discovered in the United States (New York, Michigan, Kansas, Missouri. Minnesota, North Dakota, South Dakota, Oklahoma) and in Alberta, Canada.

This disease affects the leaf, ear, and grain of wheat. On the ears, the glumes show at the base a dull brownish black tinge. Sometimes, this dark area extends over nearly the whole surface of the glume; but usually only the lower third or less is darkened, and often no discolouration is visible on the exterior. Glumes that present a normal colour on the outer surface may have the inner surface discoloured. In every case, dissection of the spikelet reveals more signs of disease on the inner surfaces than on the outer. Often a narrow dark line at the junction of the spikelet and the rachis is the only outward sign of disease. The grain enclosed by diseased glumes shows varying degrees of undevelopment. The fact that the grains are often well filled out seems to indicate that the disease sometimes appears late in the course of growth. In diseased grain the base varies in colour from a scarcely noticeable brown to charcoal black. In the discoloured areas, bacteria are found in great abundance, which have been isolated and pure cultures obtained. The organism in question studied by the author from the point of view of cultural characters is considered to be the cause of the wheat disease in the pre-mentioned regions. It was a hitherto undescribed organism, and it is here designated as *Bacterium atrofaciens*.

Inoculations on young wheat plants have given rise to numerous leaf infections. Fewer mature plants have been available for inoculation of ears and besides this, the weather conditions were somewhat unfavourable. However, enough infections were effected to determine the positive pathogenicity of the organism for glumes and kernels. The organism has also been re-isolated from the glumes and kernels of inoculated ears, and a second series of inoculations effected on the ears and spikelet leaves. Infection was evident also in this second case and it was possible to reisolate the bacteria once again.

INJURIOUS INSECTS

926.—Trachelus Tabidus, Black Grain-Stem Sawfly of Europe, Injurious to Wheat and Other Cereals, Introduced into the United States.—GAHAN, A. B., in *United States Department of Agriculture, Bulletin* 834 pp. 1-18, bibliography of 56 works, Washington, D.C., May 19, 1920.

During the summer of 1918 it was discovered that another exotic insect liable to cause considerable damage to agriculture,

has become established in America. A complaint was received by the Bureau of Entomology, Washington, D.C., from a correspondent at Gaithersburg (Maryland) regarding the work of certain attacks which had caused serious damage to ripening wheat, and steps were immediately taken to investigate the outbreak with the result that this insect was identified as *Trachelus tabidus* (Fabricius) Jurine; this sawfly belonging to the genus *Cephidæ* has already been referred to in European literature (England), and goes by the popular name of "black grain stem sawfly."

In the Old World Continents, the species occurs throughout most of central and southern Europe, south-eastern Asia, and northern Africa.

In America, the insect was found, before 1918, in New Jersey, Virginia, Delaware, Maryland, Pennsylvania and New York.

It is probable that the species has even now spread and is likely to spread over a very wide area of the New Continent just as it did the Old.

Various cereals, especially wheat, but also barley and rye, have been attacked, and the Russian records are more specific and confirm this statement.

In America only wheat and rye have thus far been recorded; it appears certain that wheat is the food plant preferred. It is not improbable that *Tr. tabidus* also attacks plants other than those mentioned.

The author gives the synonymy of the insect, and describes the adult and the hibernating larva, and also makes preliminary observations with reference to the life history of the sawfly.

The larvæ burrow downwards through the stem pith hollowing it out to the base; before preparing to hibernate, this larvæ severs the stem from the inside at or very near the surface of the ground, leaving the epidermis of the straw intact sufficient to allow it to stand erect; the first slight bending of the ripened straw causes it to snap off and fall, having the same effect as a strong wind.

An efficacious chalcidoid parasite of *Tr. tabidus* has been notified in America; reared from a species which has apparently never been described, belonging to the genus *Pleurotropis*.

It is recommended to plough in the stubble containing the larvæ so deeply that the maturing adult will be unable to escape. Wheat, barley and rye should be followed by some crop which will not serve as a host plant, such as maize or market crops.

705.—On the Action of Chloropicrin on the Parasites of Wheat and on Rats.—PIUTTI, A., in the *Comptes rendus des Séances de l'Academie des Sciences*, First Half-year, 1920, Vol. CLXX, No. 14 (April 6, 1920), pp. 854-856. Paris, 1920.

The author states that recent experiments by M. G. Bertrand and his collaborators (1919-20) on the toxic action of chloropicrin on various animals clearly confirm the experimental results obtained by himself and M. L. Bernardini and published in 1917 and 1918.

Regarding the action of chloropicrin on the parasites of wheat (*Calandra granaria, Tenebrioides, mauritanicus, Læmophlæus ferrugineus, Sitotroga cerealella, Tinea granella, Plodia americana*), it should be observed that the numerous experiments by MM. Piutti and Bernardini, which were always conducted with wheat that was very much damaged, were carried out at first on a small scale under bell-jars, and then on a large scale on tons of wheat stored in a corn mill. All these experiments clearly showed that if chloropicrin acts on wheat for about a week at a strength of 20 cc. per cubic metre of space (whether occupied by wheat or not) at a temperature of about 15-20°C., excellent results are obtained as far as the death of the parasite is concerned. Under these conditions, the parasiticidal action of chloropicrin is greater than that of carbon bisulphide, which, if the same results are to be obtained, must be used in far greater quantities and has, moreover, well known disadvantages (inflammability). Other things being equal, it has been shown that a higher temperature greatly assists the parasiticidal action of chloropicrin, as this becomes more volatile.

Flour and bread made from wheat treated with chloropicrin was quite harmless and had lost none of its food value. It is remarkable, however, that wheat treated with chloropicrin loses about 30 per cent of its germinating capacity. In M. Bertrand's experiments, the amount of liquid used per cubic metre was about 10 times that employed by M. Piutti and Barnardini; in this case, it can be foreseen (apart from the disadvantages of such high concentrations from the practical point of view) that the germinating capacity of the grain would undergo too violent a destructive action.

Experiments carried out by MM. Piutti and Bernardini in 1917, with the object of testing the use of chloropicrin for freeing ships from rats, were at first made in the laboratory in suitable chambers and afterwards in ships' holds of a capacity of 800 and 1075 cu. m. respectively. When the chloropicrin, placed in a tin on deck was allowed to fall drop by drop into a canvas tube containing cotton-wool, all the rats that had been placed at varying heights in the hold were dead in two and a half hours. These results

were obtained by using only 1·5 kg. of chloropicrin, *i.e.*, 900 cc. of liquid. Experiments by M. Bertrand, with much higher concentrations than those employed by MM. Piutti and Bernardini, confirm the results of these authors and also show that the rat fleas were killed as well as the rats, a result which is of vital importance as regards the transmission of disease.

595.—**Action of Chloropicrin on Various Fungi.**—MATRUCHOT, L., and SEE, P., in *Comptes rendus des Séances de la Société de Biologie*, Vol. LXXXIII, No. 7, pp. 170-171. Paris, February 21, 1920.

The toxic action of chloropicrin on animals suggested to the authors the idea of trying its action on fungi. They used a closed area in which the air was saturated with toxic vapour. The fungi were left in this air for periods varying between 7 minutes and 8 hours, then withdrawn and immediately replanted to ascertain their vitality. The experiments showed that the most fragile fungi are: *Hypomyces ochracea* (conidia and chlamydospores), killed without fail after 30 minutes; then *Mucor mucedo* (sporangia), *Botrytis cinerea* (conidia), *Sclerotium echinatum* (sclerotia), killed after 3½ hours; then *Nocardia* sp. (arthrospores), *Penicillium* sp. (conidia), *Amblyosporium* sp. (arthrospores), and *Chætomium bostrychodes* (perithecia), which die after period of contact longer than 5 hours 40 minutes and shorter than 8 hours.

In an atmosphere not saturated with chloropicrin, but containing 10 cgm. per litre of air, all the fungi except *Amblyosporium* sp., were killed in 48 hours, and double the strength killed even that fungus in 42 hours.

The fungi experimented on belonged to very different groups and represented the most varied vegetative or reproductive forms (mycellium, arthrospores, conidia, chlamydospores, sclerotia, perithecia) and it may be concluded from the results that chloropicrin will completely disinfect an enclosure in respect of any fungi it contains. It suffices to employ the toxic vapour at saturation point for 8 hours, or at a smaller concentration during a longer time which, however, is apparently not more than a few days.

821.—**Chlorochroa Sayi, Grain Bug Injurious to Wheat and Other Crops in the United States.**—CAFFREY, D. J., and BARBER, G. W., in the *Department of Agriculture, Bulletin* 779, pp. 1-35, Washington, D.C., 1919.

Since 1911, *Chlorochroa sayi*, Stal has caused serious damage to wheat and other crops in the inter-mountain and south-western States. The most important damage is caused by the insect piercing the newly-formed heads of the cereals and feeding on the liquid content, which prevents the formation of the grain or greatly reduces its weight.

The reduction in yield from grain bug attack varies from 10 to 50 per cent of the crops. In extreme cases the entire crop may be destroyed.

The cultivation of large areas formerly devoted to grazing, eliminated the native food plants of the insect and caused it to attack cultivated plants and resulted in an increase of the pest beyond its former abundance.

Wheat, barley, and rye are the cultivated crops most preferred by this bug. The species also feeds on other cereals, and on alfalfa, cotton peas, beans, cabbage, tomato, and lettuce, in addition to many wild native plants.

The first damage was recorded in 1903, and since that time serious attacks have been reported from most of the States west of the Great Plains area.

Weather and the work of parasites generally restrict destructive outbreaks in each locality to periodic intervals of two or three years.

Adults emerge from hibernation in the early spring and deposit eggs on the material composing the hibernating quarters. The resulting nymphs feed upon tender plants growing in their vicinity. Upon reaching maturity the adults migrate to cereal crops and feed upon the developing heads.

There are three distinct generations and sometimes a partial fourth generation annually. About 50 days are required to complete the life cycle of each generation. After midsummer, the numbers of the insects are greatly reduced by an egg parasite, *Telenomus ashmeadi*, and by two species *Gymnosoma fuliginosa* and *Ocypterodes euchenor* which parasitize the adults. Several kinds of predacious enemies contribute to the same result.

Hibernation occurs in the adult stage under weeds and rubbish. No nymphs or eggs survive the winter. Severe winters result in the death of a large number of hibernating adults and constitute one of the most important factors in restricting destructive outbreaks of this species. During normal winters, at least 95 per cent of the adults survive when hibernating in protected places.

The most effective and practical method of control is the destruction of the adults while concentrated in their winter quarters. This is best accomplished by turning under or burning all rubbish and weeds (particularly Russian thistle, *Salsola Tragus*) in and about cultivated fields.

Trap crops, hand picking and hopper-dozers might prove practical in the control of the insect under special conditions.

603.—**Bruchus Rufimanus, A Beetle Injurious to Beans in California.**—CAMPBELL, R. E., in the *U. S. Dept. of Agric., Bulletin* 807, pp. 1-22, Washington, D.C., January 27, 1920.

Of late, bean growing, in California has been seriously affected by the presence of the bean weevil (*Bruchus rufimanus* Boh.).

Although this beetle was recorded for the first time in the United States in 1909, it has probably been present there since 1888. Wherever beans are grown in California, the beetle has been found; it not only decreases the value of the product, but it has even led the farmers to reduce considerably the area devoted to the crop.

B. rufimanus has one generation a year and does not develop in dried beans. The egg stage lasts 9 to 18 days, the larval stage 10 to 15 weeks and the pupal stage 7 to 16 days; the adult lives from 1 to 8 months. The eggs are laid on the green pods in the fields from the middle of March to the middle of May; the larvæ are full-grown by August and September and the adults can be found from August to the June of the following year.

The damage caused by the bean weevil is mainly due to the fact that the larva feeds and becomes the perfect insect inside the seeds. Many adults remain in the seeds for several months, thus rendering them unfit for food, but other adults leave the seeds as soon as they have passed the pupal stage, leaving round holes in the seeds at the place where the larvæ have fed on the tissues. The appearance of these seeds decreases their chance of sale, and, moreover, the seeds are not only lighter but have a reduced germinating power. The germination power of infested beans is 20 to 40 per cent less than that of healthy ones. The germination of seeds one year old or more is only slightly less than that of new seed.

In America, there are no natural enemies of the beetle that provide an efficacious and sure control.

Exposure to a temperature of 77-82°C. for over 90 minutes kills all the beetles present in the seeds. Fumigation with sulphur is not an efficient method of control. Carbon disulphide in the proportion of 112 gm. per cu. metre in a hermetically closed receptacle, causes the death of all the *B. rufimanus* in the seeds. It has been found that, in seeds kept for two years, all the beetles were dead. Seeds from late crops (after March 1) are much less attacked than those from early crops (November to March.)

AGRICULTURAL STATISTICS

THE WHEAT CROP OF 1921

In an article in the "Agricultural Gazette" for September-October a review of the cereal situation was given. This review included, at page 592 of the "Gazette", a table giving the production of wheat in different countries. Since the date of publication of that article official estimates have been received for the first time this year for a number of countries, especially in the southern hemisphere, for which estimates based on acreage and condition figures have had to be made.

The latest figures show an increase in the production of wheat in Europe over the estimates previously made. The most notable increase is in France which is now producing on practically a pre-war basis. The total crop of Europe is now estimated as 217,000,000 bushels greater than last year.

The world's total is given as 97,000,000 bushels more than in 1920. It must always be remembered, however, that Russia, which produced such large crops in pre-war days, is not now taken into consideration.

Countries	1921	1920	Pre-war average 1909-13
	Bushels	Bushels	Bushels
Europe—			
Germany	97,848,000	82,859,000	(*b*) 113,100,000
Austria	(*a*) 6,900,000	5,494,000	(*b*) 5,422,000
Belgium	11,523,000	10,275,000	14,894,000
Bulgaria	42,510,000	39,705,000	(*b*) 29,308,000
Denmark	(*a*) 7,000,000	6,945,000	5,344,000
Spain	143,205,000	138,606,000	130,447,000
Jugo-Slavia	(*a*) 78,000,000	64,712,000	
Finland	276,000	272,000	251,000
France	315,639,000	230,406,000	317,639,000
Alsace-Lorraine	7,132,000	5,907,000	3,763,000
Great Britain and Ireland	57,000,000	56,898,000	59,640,000
Greece	11,170,000	12,194,000	(*b*) 9,400,000
Hungary	44,700,000	38,295,000	
Italy	188,128,000	141,338,000	183,336,000
Luxemburg	(*a*) 500,000	449,000	615,000
Norway	(*a*) 500,000	1,035,000	306,000
Netherlands	7,523,000	6,677,000	4,896,000
Poland	34,837,000	18,258,000	
Portugal	(*a*) 7,000,000	7,140,000	7,440,000
Roumania (old Kingdom)	33,000,000	24,000,000	87,792,000
Sweden	11,019,000	10,528,000	8,103,000
Switzerland	3,800,000	3,586,000	3,314,000
Czecho-Slovakia	40,000,000	26,167,000	23,541,000
Total Europe	1,149,210,000	931,746,000	(*c*) 1,008,551,000
North America—			
Canada	294,388,000	263,189,000	197,118,000
United States	740,655,000	787,128,000	686,697,000
Total North America	1,035,043,000	1,050,317,000	883,815,000
Asia—			
India	250,468,000	377,887,000	359,035,000
Japan	27,874,000	28,288,000	24,166,000
Total Asia	278,342,000	406,175,000	383,201,000
Africa—			
Algeria	41,480,000	8,561,000	34,998,000
Egypt	37,010,000	31,711,000	34,121,000
Morocco	20,040,000	22,000,000	(*b*) 18,202,000
Tunis	9,921,000	5,225,000	6,230,000
South Africa	(*a*) 8,000,000	8,113,000	6,520,000
Total Africa	116,451,000	75,610,000	100,071,000
South America—			
Argentina	(*a*) 175,000,000	184,930,000	148,908,000
Chile	(*a*) 27,000,000	25,180,000	14,000,000
Uruguay	(*a*) 10,000,000	10,321,000	6,519,000
Total South America	212,000,000	220,431,000	169,427,000
Australasia—			
Australia	137,000,000	146,795,000	90,500,000
New Zealand	(*a*) 6,000,000	6,674,000	7,070,000
Total Australasia	143,000,000	153,469,000	97,570,000
World's Total	2,934,046,000	2,837,748,000	(*c*) 2,642,635,000

(*a*) Estimates based on condition and acreage.
(*b*) Average 1915–19.
(*c*) Less Jugo-Slavia, Hungary and Poland.

EUROPEAN CROPS OTHER THAN WHEAT

The total production of rye in Europe, including Germany, Belgium, Bulgaria, Spain, Finland, France, Alsace-Lorraine, Greece, Hungary, Italy, Netherlands, Poland, Sweden and Switzerland, is 571,907,000 bushels against 436,335,000 last year. The large increase is due almost entirely to Germany and Poland.

The production of barley in Germany, Belgium, Bulgaria, Spain, Finland, Greece, Hungary, Italy, Netherlands, Poland, Sweden and Switzerland, is 301,838,000 bushels against 285,652,000 last year.

The production of oats in Germany, Belgium, Bulgaria, Spain, Finland, Alsace-Lorraine, Greece, Hungary, Italy, Netherlands, Poland and Switzerland is 678,823,000 bushels against 668,773,000 last year.

The production of potatoes in Belgium, Bulgaria, Spain, Finland, Alsace-Lorraine, Hungary, Netherlands and Switzerland, is 400,626,000 bushels against 442,750,000 last year.

The production of corn in Bulgaria, Spain, Greece and Hungary is 95,175,000 bushels compared with 121,410,000 in 1920.

UNITED STATES OCTOBER CROP REPORT

Crops	1921	1920	Average 1915 to 1919
	Bushels	Bushels	Bushels
Wheat	740,655,000	787,128,000	830,896,000
Rye	64,332,000	69,318,000	69,159,000
Barley	163,399,000	202,024,000	208,098,000
Oats	1,078,519,000	1,526,055,000	1,432,697,000
Corn	3,163,063,000	3,232,367,000	2,797,625,000
Flaxseed	8,878,000	10,990,000	11,704,000
Potatoes	345,844,000	428,368,000	371,283,000
	Tons	Tons	Tons
Hay	94,619,000	108,233,000	103,397,000

UNITED STATES WHEAT SUPPLY SITUATION ON OCT. 1

—	This Year	Last Year
Farm carry-over July 1	54,000,000	48,000,000
Crop	741,000,000	787,000,000
Total supply	785,000,000	835,000,000
Marketed to October 1st	377,000,000	287,000,000
Balance on farm	418,000,000	548,000,000
Farm seed and feed	100,000,000	101,000,000
Balance left on farm net	318,000,000	447,000,000
The supplies on October 1 are distributed as follows:		
On farms, net	318,000,000	447,000,000
Country mill and elevator stock	152,000,000	129,000,000
Visible supply	59,000,000	29,000,000
Total on hand	529,000,000	605,000,000

This statement shows that there are 76,000,000 bushels less wheat in the country than last year.

THE WHEAT SITUATION

(From Broomhall's Corn Trade News, Oct. 11, 1921)

The decline of values in America has undoubtedly been a great disappointment to many traders on the other side of the Atlantic, and we cannot doubt that severe losses have been sustained. In the case of one prominent firm fresh arrangements for dealing with open contracts were deemed necessary, but all liabilities were met. In this country there have also been severe losses and some minor failures. The real root of the present difficulties appears to be the general determination of growers alike in North America and Europe to market their wheat at the earliest moment possible; it is naturally

expected that many will want to sell immediately after harvest, but it is now some time since the harvests were gathered and still the tide flows strongly, although we are assured by the "Modern Miller", of Chicago, that the soft wheat States have shipped practically all their surplus, whilst supplies in some parts of the hard winter region are low. It goes without saying that if the foregoing statement is founded on solid facts, the expected sharp decrease in the U.S. crop movement must come at an early date, but in the meantime, as already said, people on this side of the Atlantic may well feel somewhat sceptical as to the correctness of U.S. statistics of supplies. We await further developments in the U.S.A. and Canada, but may point out that on present information no one can entertain reasonable doubt that these producers will furnish, during the current season, the full quantity (400,000,000 bushels) with which we have credited them.

Turning to exporting countries other than North America, we have to report that all seems to be going well with the new crops and the outlook for these supplies remains distinctly hopeful. In about five weeks from now both Argentina and Australia will be starting the harvest of the new crop, and the question naturally arises—will Argentine and Australian farmers also rush their new crop of wheat to market as the winter wheat farmers of the States did and as the spring-wheat farmers of the U.S.A. and Canada are doing? Argentina has made further drastic price reductions, but we hardly expect a large part of the balance of the last crop will be shipped between now and Christmas. Manchurian offers too, seem somewhat of a mystery; if the country possesses the surplus so confidently reported why do we not find liberal quantities now on offer on our markets?

Importing countries, with the exception of France, are taking foreign wheat about as we expected; however, the season is very young yet, so the figures at present available have not much value as indications. Taking a general survey we can report that we are not inclined to increase our preliminary estimate for any country; with reference to the lack of demand for foreign wheat in France, it may be stated that French people prior to the war were quite accustomed to eat bread made from their native wheat only, and we have heard it praised very much by our own countrymen. One fact emerges from recent reports from France, namely, that the taste for rye bread is notably lacking, and this fact can be expected to increase the wheat consumption.

To sum up the position, there is no certain evidence that the statistics of wheat supplies and requirements have gone badly astray anywhere, although the heavy deliveries of American farmers have caused some doubts with respect to the available supplies in that quarter. The quantities as we reckon them undoubtedly show a surplus after providing for all likely requirements, including a fair quantity for Russia. It is a well known fact that the markets usually look very weak when prices have about touched bottom, but we cannot but think that there must be further weakness if growers, either in North America or elsewhere, continue to force large quantities on markets which are already well supplied, and probably the weakness will still be experienced, even if a large part of the trade in America are firmly convinced that their country will have shipped out practically all its available surplus at a comparatively early date.

We alluded last week to the schemes which are before the country with the object of improving commerce, and these matters are being kept well to the front in the political world. It is generally assumed that the Government are about to take some steps to reorganize international trading, and this should not be entirely left out of grain operatives' calculations, for it is within the bounds of possibility that some measures may be devised to improve "exchange" and thus increase the purchasing power of continental nations. Moreover, it must not be forgotten that prices now are about half of what they were not very long ago, consequently the demand generally should be larger, whilst at the same time selling pressure from producers should be less.

SOUTH AFRICA

Classification	1920	1921	Increase (+) or decrease (−)	
			In number	Percentage
Horses	690,124	695,138	− 5,014	− 0·7
Asses	523,550	498,616	+ 24,934	+ 5·0
Cattle	5,974,802	5,575,488	+ 399,314	+ 7·2
Sheep	26,288,960	26,491,500	−2,202,540	− 7·7
Goats	4,895,080	5,842,270	− 947,190	− 16·2
Swine	560,155	724,007	− 163,852	− 22·6
Ostriches	283,980	282,070	+ 1,910	+ 0·7

MADAGASCAR

Classification	1920	1916	Increase (+) or decrease (−)	
			In number	Percentage
Cattle	7,518,657	6,588,064	+ 930,593	+ 14·1
Sheep	300,000	308,751	− 8,751	− 2·8
Swine	1,000,000	543,585	+ 456,415	+ 84·0

ENGLAND AND WALES

Classification	4 June, 1921	4 June, 1920	Increase (+) or decrease (−)	
			In number	Per centage
Horses	1,384,400	1,365,700	+ 18,700	+ 1·4
Cattle	5,515,600	5,546,800	− 31,200	− 0·6
Sheep	13,806,200	13,382,700	+ 423,500	+ 3·2
Swine	2,505,700	1,993,900	+ 511,800	+ 25·7

LATEST CROP REPORT

A cablegram received from the International Institute of Agriculture on October 24th gives the following summary of the world's crops:

The production data for cereals for 1921 previously communicated is practically unchanged. The production of potatoes and sugar beets is generally below last year's. The production of wine for 1921 in Italy is 7,259 million gallons or a percentage as compared with 1920 of 78.0. Egyptian cotton is reported 1,662 thousand metric tons, a percentage of 61.3 of previous year. The sowing of cereals is being impeded through drought in Germany, Belgium, Italy, Czechoslovakia, but is proceeding actively in France, and Roumania. Conditions in United States and India are favourable.

THE AGRICULTURAL GAZETTE OF CANADA

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